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Five working papers dealing with navigation training, crew and platoon gunnery, armor training, rapid train-up, One Station Unit Training, and an annotated bibliography of ARI Fort Knox Field Unit publications, 1980-1984.

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MICROTICCIT COURSEWARE FOR "NAVIGATE FROM A TO B": INSTRUCTOR'S GUIDE

Decisions and Designs, Inc.

May 1985

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	COURSEWARE OVERVIEW	3
3.0	HOW TO USE THE COURSEWARE	5
	3.1 System Start Up	5
	3.2 Courseware Materials	6
	3.3 Courseware Items	7
	3.3.1 Free travel	7
	3.3.2 Skills review	8
	3.3.3 Navigate from A to B	9
	3.3.3.1 Terrain Association	9
	3.3.3.2 Dead Reckoning	10
	3.3.4 Navigation test	12

MicroTICCIT COURSEWARE FOR "NAVIGATE FROM A TO B": INSTRUCTOR'S GUIDE

1.0 INTRODUCTION

This manual describes the role of the instructor in the use of the 19K BNCOC MicroTICCIT courseware for "Navigate from A to B" (Unit 3, Lesson 9). The courseware for this lesson differs from other MicroTICCIT courseware because it is based on the Decisions and Designs, Inc. (DDI) Advanced Terrain Representation (ATR) surrogate travel technology. The ATR technology, which simulates free travel over open terrain, can only be implemented on specially modified MicroTICCIT workstations. The ATR-based courseware is used differently than the courseware for other units and lessons. Differences between the ATR-based courseware and other MicroTICCIT courseware can be summarized as follows:

- A MicroTICCIT workstation capable of running ATR-based courseware has two videodisc players, a PC-like interface unit, and a combination joystick/keypad, in addition to the standard terminal (modified IBM PC) and monitor;

- MicroTICCIT courseware that uses ATR resides on videodiscs and floppy diskettes, instead of residing permanently on the MicroTICCIT system. Therefore, you as instructor must verify that the proper videodiscs (two identical laser videodiscs labeled ATR) are in place in the videodisc players, and that the appropriate ATR floppy diskette is in the MicroTICCIT workstation diskette drive; and

- The ATR-based courseware for "Navigate from A to B" does not communicate directly with the InterAmerica Computer Managed Instruction (CMI) system. You, as the instructor, must start the student on the courseware; key in a special password to access tests; enter the student's name and attempt number; record the results after the test has been completed, and key in a password to free the system after a test has been taken.

The rest of this manual describes the courseware for "Navigate from A to B" and explains the actions that you will take as the instructor for this lesson. Section 2.0 briefly describes what the student will see and do while interacting with the courseware (we recommend that each instructor go through the courseware, playing the student role, at least once before using it to train or test students). Section 3.0 explains how to access the training and testing functions. More technical information about system functioning and maintenance may be found in Advanced Terrain Representation for the MicroTICCIT Workstation: System Maintenance Manual, which was published concurrently with this Instructor's Guide.

2.0 COURSEWARE OVERVIEW

The courseware consists of five major functions, each of which is described below.

Free Travel

Students may travel freely over the terrain by communicating direction and movement with the joystick. It is important for the students to practice using the free travel function to ensure that they are comfortable with the operation of the system.

Skills Review

The skills that students must understand completely before proceeding to the land navigation training section are reviewed in this section. Without a thorough understanding of these skills, students may make errors in the "Navigate from A to B" training section because of a lack of understanding of the basic prerequisite skills. This section reviews the following skills: the six-digit coordinate system, azimuth determination, azimuth conversion, straight line distance measurement, distance measurement around curves, and self-location.

Navigate From A to B

In this section, students are led through the 19K BNCOC Lesson Plan (Task No. 071-329-1006). The land navigation methods, terrain association and dead reckoning, are introduced and explained separately. After each method explanation, the students are presented with two problems using the specific method of navigation. First, students are led through

an example problem. Second, they are given a practice problem which requires the students to navigate a predetermined route which permits free travel between the start point, intermediate points, and the release point.

Navigation Test

This section administers the test for "Navigate from A to B". The instructor must enter a password, the student's name, and the attempt number (one, two, or three) before the system will allow access to the actual test administration. The test contains three problems in which students are given the coordinates of the start point and release point for each problem, and permitted to travel freely to navigate a route to the destination. Students should be able to navigate from point A to within 50 meters of point B. The system displays the results of each problem and determines whether the instructor should enter a GO or NO GO into the student's Master Record. The instructor must enter another password to free the system after the test has been taken.

Because students are allowed three attempts to pass a test on this task, they are provided three separate tests (one for each possible attempt).

Shut Down ATR System

This selection deletes the menu from the screen and provides instruction regarding the switches on the videodisc players. These switches are configured differently for MicroTICCIT CMI and for MicroTICCIT adapted for ATR and must be changed before and after using MicroTICCIT with ATR. After the switches have been reset, pushing the button on the joystick shuts down ATR.

3.0 HOW TO USE THE COURSEWARE

The following sections describe the system start up, the system equipment, and the courseware functions.

3.1 System Start Up

Before starting up the system, verify that the MicroTICCIT workstation is ATR compatible. Make sure that the following equipment is present and installed.

- One additional videodisc player (making a total of two videodisc players);
- An Interface Unit, (a white box with a tinted plexiglass front panel); and
- A combination joystick/keypad.

Having determined that all the required equipment is present, start up the system using one of the following procedures.

If the system is off:

- Place the MicroTICCIT ATR Land Navigation Diskette in the left disk drive, drive A. If there is only one disk drive, place the diskette in the disk drive.
- Turn the system on by flipping the switch on the right side of the MicroTICCIT terminal to the on position.

If the system is already on, and an A prompt (A>) appears:

- Push the A_x, ALT CODE, and BACK keys simultaneously; or
- Type ATRNAV.

If the system does not turn on after you tried one of the two methods above:

- Make sure the switch in the back of the interface unit is in the "on" position; and
- Make sure the videodiscs are in the videodisc players.

For a more detailed description of the system equipment, system setup, and system start up, refer to Advanced Terrain Representation for the MicroTICCIT Workstation: System Maintenance Manual.

3.2 Courseware Materials

In addition to the MicroTICCIT workstation adapted for ATR, make sure that the following materials are available before allowing a student to use the courseware:

- ATR terrain map encased in acetate;
- ATR military protractor;
- Water soluble felt tip pen for marking on acetate; and
- Scratch paper with straight edge.

It is also useful for the instructor to have an FM 21-26 available as a reference source.

3.3 Courseware Items

The courseware menu consists of five items which are chosen by using the joystick to highlight the desired item. The joystick must be pulled toward you to move the highlight down the list and pushed forward, or away from you, to move the highlight up the list. After the correct selection is highlighted the student presses the button on the joystick to access the specific selection. Each of the courseware items is described in the following sections.

3.3.1 Free travel - In this segment of the courseware the student uses the joystick to communicate direction and movement to travel over the simulated terrain. It is important for the student who has never used the courseware to practice free travel and become comfortable with the system and its functions.

Before the student begins the Free Travel option, make sure that the joystick is held or placed on a table with the keypad closest to the system and the joystick closest to the student. Pushing the joystick forward or backwards causes respective forward or backward movement on the terrain. Pushing the joystick to the right or to the left causes pivoting to the right or to the left, respectively. However, the system does not respond the same way as an automobile responds to turning while traveling. To make a 90° turn to the right the student must push the joystick to the right and watch the terrain on the screen until the magnetic compass bearing shows that a 90° turn has been completed. The student may then continue forward.

A message line along the bottom of the screen contains the compass reading (a magnetic azimuth, not a grid azimuth) and the odometer reading (given in meters). These readings appear whenever terrain is pictured on the screen. Six-digit coordinates also appear in the message line, but only in the Free Travel section.

3.3.2 Skills review - In the skills review section the system explains and tests the user on the basic skills which are required in the land navigation training section. Results from the review are not entered into the student's 19K BNCOC Master Record. The skills reviewed are:

- o Understanding the six-digit coordinate system;
- o Azimuth determination;
- o Azimuth conversion;
- o Straight line distance measurement;
- o Distance measurement around curves; and
- o Self-location.

After each explanation, the student is presented a problem for the specific skill. All responses are given using the numbers on the joystick/keypad. The "*" key is used to backspace, and the "#" key is used to enter an answer. If the student gives an incorrect answer the system gives a short response which may be helpful in correcting the error. The student is given three opportunities to respond correctly. If, after the third try, the response is still incorrect the system gives the correct answer and proceeds to the next skill to be reviewed.

The only skills section requiring an explanation is the self-location portion. The student is placed somewhere on the terrain and asked to determine the coordinates of the location. The system allows movement within a 30 meter radius

around the student's present location and beeps when further movement in that direction is no longer permitted. The student may then return to the original location by pressing the button on the joystick.

If an incorrect answer has been given at any time during the review section, the system will display a list of references at the end of the section that the student should review before proceeding to the land navigation training courseware.

3.3.3 Navigate from A to B - This particular section is divided into three categories: Terrain Association, Dead Reckoning, and Return to Main Menu. Categories are accessed by using the joystick for highlighting and selection. The courseware for Terrain Association and Dead Reckoning is described in the following sections.

3.3.3.1 Terrain Association - The Terrain Association segment consists of an example problem and a practice problem.

Example Problem

At the beginning of the explanation of the terrain association method, the distinctive aspects of terrain association are reviewed and the student is given a list of steps for planning a route. The student is taken through an example navigation problem in which the courseware leads the student through the navigation problem, step by step, using terrain association.

First, the coordinates of the start point and the destination, or release point, are given. The student is asked to mark the start point and release point on the map. Next, the

student draws a line from the start point to the destination and determines the grid and magnetic azimuths between the two points. The terrain features and coordinates of three checkpoints and the release point are given to the student. The student marks each one of these points on the map and measures the distance between successive points along the route.

After the route is planned, the courseware simulates travel from start point to each checkpoint; notes the specific qualities about the checkpoints along the route; and instructs the student to compare the actual distance traveled with the measured distance for that particular leg of travel.

Practice Problem

In the practice problem the student is given the coordinates of the start point, checkpoints, and release point and is prompted to obtain certain information. The student may travel freely from one location to the next along the route. Assuming that the next location is found, the student presses the button on the joystick, and the system gives a "correct" response if the student is within 30 meters of the desired location. If the student is more than 30 meters away from the desired location, the system gives an instruction to press the button on the joystick to be placed at the correct location. The student then proceeds through the rest of the practice problem.

The system keeps track of the points the student is able to correctly locate and responds according to the student's ability to navigate to the specified point.

3.3.3.2 Dead Reckoning - Both example and practice problems are provided for Dead Reckoning.

Example Problem

At the beginning of the explanation of the dead reckoning method the distinctive aspects of dead reckoning are reviewed, and a list of steps for planning a route is given. It is important for students to learn to keep a log of the route that is navigated, so the system creates a sample log of the route throughout the example to show the student how to create a log correctly.

The courseware leads the student step by step through a land navigation problem using dead reckoning. The student is given the coordinates of the start point and the release point. The student marks these points on the map, and records the current odometer reading in the log as point A. The system places the student on the terrain at point A, facing the direction of the release point, but prescribes a direction of travel. The student records the magnetic and grid azimuths of travel in the log. The courseware determines an intermediate point, or checkpoint, in the direction of the release point. The student plots the point on the map and records the distance measurement to this point in the log.

After the leg of travel is planned, the system simulates travel from the start point to the intermediate point. The student records the actual distance traveled in the log. The previous steps are repeated until the destination is reached.

Practice Problem

In the practice problem the student is given the coordinates of the start point, intermediate point, and the release point and prompted to obtain certain information. Free travel is permitted from one location to the next on the route. Assuming that the next location is found, the student presses

the button on the joystick. The system gives a "correct" response if the student is within 30 meters of the specified location. If the student is more than 30 meters away from the desired location, the system gives an instruction to press the button on the joystick to be placed at the correct location. The student then proceeds through the rest of the practice problem.

The system does not display a sample log of the route as the student navigates. However, at the end of the practice problem a completed log is presented, so the possible errors in the student's log can be found. Students are also given feedback on their navigated route according to their ability to locate the intermediate points and release point.

3.3.4 Navigation test - Before the student begins the navigation test, the system waits for the instructor to enter the password "HAGGARD", to which students are not given access. All instructor entries are made from the MicroTICCIT keyboard. The instructor then enters the student's name and attempt number. A student who has never taken the navigation test before would have the attempt number entered as "1". A student who has taken the test twice before would have the attempt number entered as "3". Students are allowed no more than three attempts on the navigation test to receive a GO in the Master Record. The system administers one of three tests according to the attempt number that is entered. Each test contains three navigation problems.

The student is given the coordinates of only the start point and the release point, not the checkpoints, and is permitted free travel. The student indicates reaching the release point by pressing the button on the joystick. The system tells the student whether this location is within 50 meters of the specified location.

After the third problem the test is finished, and the system displays:

- The student's name;
- The attempt number;
- The distance of the student's destination from the actual destination associated with each test problem; and
- A PASS or FAIL for each test problem.

The system tells the instructor to record a GO for the particular attempt number in the Master Record if the student has a PASS for at least two problems on the test. The instructor records a NO GO in the Master Record if the student has fewer than two passes on the test. To insure that the instructor has an opportunity to see the student's results and enter them in the Master Record, the system locks in the results screen. To exit from this screen and the land navigation test segment, the instructor enters the password "BLASCHE".

Working Paper

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Crew and Platoon Gunnery Practice Exercises

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Human Resources Research Organization

MDA903-86-C-0335

March 1990

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CREW AND PLATOON GUNNERY PRACTICE EXERCISES

Contents

	Page
PART I	
Crew Gunnery Practice Exercises	I-1
Prepare-to-Fire Exercise	I-1
Dry-Fire Exercises	I-1
References	I-3
ANNEX A. Prepare-to-Fire Exercise	I-A-1
APPENDIX 1. Defects for Prepare-to-Fire Exercise	I-A-1-1
APPENDIX 2. Record Sheet for Prepare-to-Fire Exercise	I-A-2-1
ANNEX B. Crew Gunnery Practice Exercises	I-B-1
APPENDIX 1. Conditions for Dry-Fire Exercises	I-B-1-1
APPENDIX 2. Example Filled-Out Record Sheet	I-B-2-1
PART II	
Platoon Gunnery Practice Exercises	II-1
Prepare-to-Fire Exercise	II-1
Dry-Fire Exercises	II-1
ANNEX A. Prepare-to-Fire Exercise	II-A-1
APPENDIX 1. Defects for Prepare-to-Fire Exercise	II-A-1-1
APPENDIX 2. Record Sheet for Prepare-to-Fire Exercise	II-A-2-1
ANNEX B. Dry-Fire Gunnery Exercises	II-B-1
APPENDIX 1. Target Sequences for Platoon Gunnery Practice Exercises A, B, C, and D	II-B-1-1
APPENDIX 2. Record Sheet Platoon Gunnery Practice Exercise (Offense-Night)	II-B-2-1

PART I

CREW GUNNERY PRACTICE EXERCISES

The attached annexes present a series of five exercises whose purpose is to prepare individual crews for gunnery qualification on Table VIII. The first exercise requires each crew to prepare their tank for the participation in dry-fire exercises. The remaining four exercises consist of dry-fire gunnery engagements whose target arrays are similar or identical to those used for Table VIII. These dry-fire exercises are intended to be executed on the Phantom Range using the I-MILES to simulate gunnery effects and through-sight video (TSV) to measure gunnery proficiency.

Prepare-to-Fire Exercise

The purpose of the Prepare-to-Fire Exercise is to present an opportunity for tank crews to practice preparing their tanks for Table VIII. During the exercise, crews will perform pre-fire checks in accordance with the M1 Operator's Manual and will boresight the tank and the caliber .50 machine gun. Annex A presents detailed procedures and record sheets for the conduct of this exercise.

Defects. Prior to the exercise, the trainer will introduce ten defects for the crew to detect and correct during the pre-fire checks. Four of these defects will be introduced to ensure that the tank and the caliber .50 machine gun systems are out of boresight. IT IS IMPORTANT THAT THE CREW NOT KNOW THE SPECIFIC DEFECTS THAT ARE INTRODUCED NOR THE NUMBER OF DEFECTS.

Recording performance. Although there are specific procedures for conducting pre-fire checks and for boresighting the tank, trainers will not be required to observe each step in these procedures. Instead, trainers will determine whether or not the defects are corrected and whether or not the tank and caliber .50 machine gun are properly boresighted. If any defects are not corrected or if the tank or caliber .50 machine gun is not properly boresighted, the trainer will ensure that these deficiencies are corrected before the start of the dry-fire exercises.

Dry-Fire Exercises

Like Table VIII, each exercise consists of 12 different engagements, 6 to be fired during the day and 6 to be fired at night. There are a total of four different exercises. The first three comprise engagements representing combinations of the conditions represented in Table VIII. The fourth and final exercise is identical to Table VIII. In contrast to Table VIII, however, there are no designated alternate engagements; all 12 engagements should be performed as stated. Each engagement specifies the target array and a fairly wide band of ranges at which the targets may be located. The inexactness of ranges is intended to allow for terrain and target placement constraints. The record sheets at Annex B provide a description of each engagement.

Task identification/sequence. Individual engagements are identified by a task number having three components: (1) the exercise number (1 - 4), (2) whether the engagement is to be fired during the day (A) or during the night (B), and (3) individual tasks within the day/night portion of each exercise (1 - 6). The order in which the tasks are performed within an exercise is not specified to allow some freedom in designing an appropriate exercise scenario within range constraints.

Friendly targets. Extensive practice with threat targets exclusively promotes the tendency to fire at any target as soon as it appears--a habit that can result in fratricide at NTC. To provide practice in target identification and appropriate responses to friendly targets (e.g., sending SITREPs), two target arrays within each exercise (one night and one day) are designated as friendly. If friendly target silhouettes cannot be obtained, equivalent threat targets should be substituted.

Recording performance. In contrast to Table VIII, the purpose of recording performance in the present dry-fire exercises is not to determine crew qualification. Rather, the purpose is to identify the exact nature of performance deficiencies so that trainers can diagnose problems and prescribe appropriate corrective actions for the crews. Thus, the present recording approach emphasizes collecting raw, unaggregated data as opposed to aggregating data into a single composite.

Performance measures. The basic criterion variables are those measures from FM 17-12-1 related to speed of performance (opening time, target engagement time, and target exposure time) and to accuracy of performance (target hit/miss). It is assumed that accuracy recording will be accomplished by reviewing TSV results rather than relying on MILES feedback, which is generally regarded as insufficiently accurate for recording gunnery. In addition to speed and accuracy measures, procedural errors (crew cuts) should also be recorded. To facilitate data collection, codes are proposed for recording speed and accuracy of performance as well as procedural errors. See Annex B for procedures and examples of using these codes.

Ammunition conservation. Because these exercises do not require live ammunition, there is a concern that crews may not learn to conserve ammunition. This could cause problems on Table VIII where they are allotted ammunition according to STRAC guidelines. Thus, it is important that evaluators consider the number and type of simulated rounds used during each engagement. Annex B provides some estimated ammunition standards against which dry-fire performance may be critiqued.

Annex A: Prepare-to-Fire Exercise
Annex B: Crew Gunnery Practice Exercises

References

Department of the Army (1986). Tank Combat Tables M1 (FM 17-12-1). Washington, DC: Author.

ANNEX A

PREPARE-TO-FIRE EXERCISE

The purpose of the Prepare-to-Fire Exercise is to present an opportunity for the crew to practice preparing their tanks for Table VIII. During the exercise, each crew will perform pre-fire checks and will boresight the tank and the caliber .50 machinegun. Prior to the start of the exercise, the trainer will select 10 defects from the list presented in Appendix I and will introduce these defects into the each crew's tank. A set of different defects should be selected for each tank. The crews will then be told to perform pre-fire checks and to boresight the tank and caliber .50 machinegun. At the end of the exercise, the trainer will determine if the defects have been corrected and if the tank and caliber .50 machinegun are properly boresighted.

Defects

The following table contains 27 defects which are organized into nine clusters. Prior to the start of the Prepare-to-Fire exercise, the trainer should select 10 defects from the list and introduce them into the tank that will be used by the crew conducting the exercise. Two of the defects should be selected from the BORESIGHT M1 TANK cluster and two should be selected from the BORESIGHT CALIBER .50 MACHINEGUN cluster. The remaining six defects should be chosen from the remaining seven clusters, but no more than two defects should be selected from any one cluster. IT IS IMPORTANT THAT THE CREW NOT KNOW THE SPECIFIC DEFECTS THAT ARE INTRODUCED NOR THE NUMBER OF DEFECTS.

Procedure

The trainer should introduce the 10 defects prior to the start of the exercise. Once the defects are introduced, he should direct the Tank Commander of the crew to perform prepare-to-fire checks and to boresight the tank and caliber .50 machinegun. When the crew complete these activities, the trainer should inspect the vehicle to determine whether or not each of the defects had been corrected and to determine whether or not the main gun and .50 caliber machinegun had been properly boresighted. The trainer should record the results of his inspection on the record sheet contained in Appendix II.

After recording performance of the crew during the exercise, the trainer should provide feedback to the crew by telling them which defects were properly corrected and which defects were not and whether or not the tank and caliber .50 machinegun were properly boresighted. The trainer must then make sure that all defects are corrected and that the tank and caliber .50 machinegun are properly boresighted before conducting the dry-fire exercises.

APPENDIX 1 TO ANNEX A

DEFECTS FOR PREPARE-TO-FIRE EXERCISE

OPERATE GUNNER'S PRIMARY SIGHT (GPS)

1. Obscure Unity Window
2. Place FIRE CONTROL MODE switch in EMER
3. Place Spent Case Ejection Guard in ARMED
4. Obscure Gunner's Primary Sight (GPS)
5. Place GUN/TURRET DRIVE switch in POWERED
6. Place GUN SELECT switch in MAIN

CHECKOUT THERMAL IMAGERY SIGHT (TIS)

7. Place THERMAL MODE switch in STBY
8. Place Test Pattern switch in TRU

OPERATE GUNNER'S AUXILIARY SIGHT (GAS)

9. Obscure Gunner's Auxiliary Sight (GAS)
10. Place Filter Switch in IN
11. Place Ammo Switch in HEAT

COMMANDER'S PRIMARY SIGHT EXTENSION (GPSE)

12. Obscure Commander's Primary Sight Extension

CROSSWIND SENSOR CHECK

13. Place CROSSWIND key light ON

COMPUTER DATA CHECK

14. Place GUN SELECT switch in COAX
15. Move MRS lever to IN

FIRING CIRCUIT TEST

16. Place Spend Case Ejection Guard in ARMED
17. Place Turret in LOCK
18. Place Elevation in LOCK

BORESIGHT M1 TANK

19. Set GPS reticle Off of Vertical Alignment of Aim Point
20. Set GPS reticle off of Horizontal Alignment of Aim Point
21. Slip GAS scales to 2 and 3
22. Set TIS reticle off of aim point
23. Place FLTR/CLEAR/SHTR switch in FLTR

BORESIGHT CALIBER .50 MACHINEGUN

24. Set Headspace Off
25. Place SAFE to FIRE switch (on MAN ELEV handle) in FIRE
26. Loosen Azi/Elev set screws
27. Remove Reticle Boresight Cross Off of Top Left Corner of Target

APPENDIX 2 TO ANNEX A

RECORD SHEET FOR PREPARE-TO-FIRE EXERCISE

CREW #:_____ TANK COMMANDER:_____ DATE_____

	DEFECT INTRODUCED		DEFECT CORRECTED	
	YES	NO	YES	NO
OPERATE GUNNER'S PRIMARY SIGHT				
1. Unity Window	____	____	____	____
2. Fire Control Mode	____	____	____	____
3. Spent Case Ejection Guard	____	____	____	____
4. Gunner's Primary Sight	____	____	____	____
5. Gun/Turret Drive	____	____	____	____
6. Gun Select Switch	____	____	____	____
CHECKOUT TIS				
7. Thermal Mode Switch	____	____	____	____
8. Test Pattern Switch	____	____	____	____
OPERATE GAS				
9. Gunner's Auxiliary Sight	____	____	____	____
10. Filter Switch	____	____	____	____
11. Ammo Switch	____	____	____	____
12. Gunner's Primary Sight Ext.	____	____	____	____
CROSSWIND SENSOR				
13. Crosswind Key Light	____	____	____	____
COMPUTER DATA CHECK				
14. Gun Select	____	____	____	____
15. MRS Lever	____	____	____	____

	DEFECT INTRODUCED		DEFECT CORRECTED	
	YES	NO	YES	NO
FIRING CIRCUIT TEST				
16. Spent Case Ejection Guard	____	____	____	____
17. Turret	____	____	____	____
18. Elevation	____	____	____	____
BORESIGHT M1 TANK				
19. GPS Reticle (Vertical)	____	____	____	____
20. GPS Reticle (Horizontal)	____	____	____	____
21. GAS Scales	____	____	____	____
22. TIS Reticle	____	____	____	____
23. FLTR/CLEAR/SHTR Switch	____	____	____	____
BORESIGHT CALIBER .50 MACHINEGUN				
24. Headspace	____	____	____	____
25. SAFE Switch	____	____	____	____
26. Azi/Elev Screws	____	____	____	____
27. Reticle Boresight Cross	____	____	____	____

Trainer: All defects must be corrected before this vehicle can be used in the dry-fire exercises. Sign in the space below when you have confirmed that all defects have been corrected.

_____
Trainer's Signature

ANNEX B

CREW GUNNERY PRACTICE EXERCISES

The present annex provides a detailed description of the Crew Gunnery Practice Exercises. Appendix 1 presents a table of conditions for each engagement within the four dry-fire exercises. Appendix 2 presents an example filled-out record sheet could be used to record performance on these exercises along with an interpretation of the example results.

The proposed dry-fire exercises demand that the trainer gather detailed information about gunnery performance with respect to each target. This requirement implies that much of this information should be coded so that it is easily recorded and interpreted. The following sections provide a description of proposed codes that could be used to record performance with the proposed record sheet as shown in Appendix 2.

Accuracy Codes

The upper portion of the boxes labeled "accuracy/ammunition" on the attached record sheets will be used to record hits and misses for each target separately. The definitions of target hits for main gun and machine gun targets follow that provided in FM 17-12-1. Main gun and machine gun engagements are handled somewhat differently: The firing and outcome of a main gun round is recorded as a single event, whereas the beginning and the conclusion of a machine gun engagement are recorded as two separate events. The following abbreviations will be used to encode accuracy:

- H: Hit target with main gun
- M: Target miss with main gun
- O: Open fire with machine gun
- K: Machine gun target is killed or suppressed

Ammunition Codes/Standards

The lower portion of the boxes labeled "accuracy/ammunition" on the attached record sheets will be used to record the ammunition whose effects are being simulated. For main gun targets, simply indicate the code corresponding to the ammunition announced in the tank commander's fire command. Alternatively, one could record the ammunition indexed in the ballistic computer. However, this information would be more difficult for a trainer to observe. For machine gun engagements, indicate the type of ammo (7.62 or Cal .50) at the beginning of the engagement and the number of rounds expended at the end of the engagement. The following codes will be used:

- S: Sabot
- H: HEAT
- C: Coax (7.62mm)
- F: Caliber .50

At the finish of an exercise, the crew's total ammunition expenditure should be compared to the following estimated standards. These ammunition requirements were not generated from a formal analysis of threat vulnerability. Rather, they were generated by extrapolating from similar engagements in Tables VII and VIII. Note that ammunition is not allocated for engagements having friendly targets. If threat targets replace friendly targets, the ammunition allocation must be upgraded accordingly.

Table 1

Suggested Ammunition Expenditure Standards for Proposed Gunnery Exercises

Exercise No.	Rounds of Ammunition			
	Sabot	HEAT	Coax	Cal .50
1A	5	4	200	50
1B	4	5	100	50
2A	4	6	100	50
2B	6	6	0	50
3A	3	5	250	50
3B	7	5	50	50
4A	9	2	200	50
4B	9	3	0	0

Response Times

In accordance with FM 17-12-1, target engagement time starts when the firing tank is exposed on a defensive task or when the target array is exposed on an offensive task. The record sheets provide blank spaces to record split times whenever a main gun engagement is fired or a machine gun engagement is initiated or terminated. In addition, target exposure time stops whenever the tank moves back into turret defilade during a defensive engagement. An ad hoc procedure for accounting for these "time out" periods and is illustrated on Task 1A2 of the filled out example.

Crew Cut Codes

As defined in FM 17-12-1, crew cuts are classified as three types: (a) failure to adhere to required conditions of the task, (b) failure to adhere to basic safety precepts, and (c) failure to use correct engagement technique or method. In Table 2, the 21 different example crew cuts listed in FM 17-12-1 are given a simple two-digit code. A blank space is provided on the record sheet to record any of the three types of crew cuts but is not described in one of the 21 examples.

Table 2

Codes for Example Crew Cuts (Taken from FM 17-12-1)

Code	Description
	Non Adherence to Conditions of the Task
1.	Not masked or buttoned up during NBC engagement.
2.	Using TIS during illumination engagement, or any sight other than the one specified for an engagement.
3.	Using components of the fire control system that are degraded in the engagement conditions.
4.	TC not firing his main gun engagement.
5.	Using the wrong main gun ammunition during an engagement.
6.	Using the wrong weapon for target effect.
7.	Firing at a friendly target array, regardless of whether or not targets were hit.
	Violations of Basic Safety Precepts
8.	Failure to follow the instruction of the TCE, control or safety officer, or unit commander while negotiating the course.
9.	Loader's shoulder guard and knee guard not in proper position.
10.	Laser-protective filters are not mounted.
11.	Leaving spent case ejection guard in ARMED position or GUN SELECT switch to MAIN or COAX when loading.
12.	Loader having round in hands between engagements.
13.	Failure to close ammunition compartment door during an engagement.
14.	Firing before receiving "FIRE" or announcing "ON THE WAY."
15.	Firing out of the impact area or outside the range fan markers.

(table continues)

Code	Description
	Incorrect Engagement Technique or Method
16.	Incorrect initial or subsequent fire command.
17.	Gunner not searching for target between engagements.
18.	Incorrect engagement sequence, i.e., firing at least dangerous target first in a multiple target array.
19.	Incorrect response to a fire command or subsequent fire command.
20.	Loader not searching for target between engagements or not observing during TC caliber .50 engagement.
21.	Ballistic doors are left open when the crew is not engaging or actively searching for targets.

Appendix 1: Conditions for Crew Gunnery Practice Exercises
Appendix 2: Example Filled-Out Record Sheet and Interpretation

APPENDIX 1 TO ANNEX B

CONDITIONS FOR DRY-FIRE EXERCISES

E X E R C I S E O N E

TASK NO.	MISSION	TARGET ARRAY	TARGET NO. 1 TYPE	TARGET NO. 1 RANGE	TARGET NO. 1 MOVEMENT	TARGET NO. 2 TYPE	TARGET NO. 2 RANGE	TARGET NO. 2 MOVEMENT	DEGRADED MODE	NUMBER CREWMEN	NBC ENVIRON?
1A1	DEFENSE	SINGLE	M1	) 1500m	MOV	---	---	---	NONE	FOUR	NO
1A2	DEFENSE	MULTIPLE	T72	) 1500m	STA	T72	)1500	MOV	GAS	FOUR	NO
1A3	OFFENSE	MULTIPLE	BMP	(900m	STA	BMP	(900m	MOV	NONE	FOUR	YES
1A4	DEFENSE	SIMUL	BMP	1000-1400m	STA	TROOPS	(900m	STA	NONE	FOUR	NO
1A5	OFFENSE	MULTIPLE	T72	) 1500m	MOV	T72	) 1500m	MOV	NO	FOUR	NO
1A6	OFFENSE	MULTIPLE	TROOPS	400-600m	STA	TROOPS	700-900	STA	NONE	THREE	NO
1B1	OFFENSE	MULTIPLE	BMP	1000-1400m	MOV	TROOPS	(900m	STA	NONE	FOUR	YES
1B2	DEFENSE	MULTIPLE	M2	) 1500m	STA	M2	) 1500m	MOV	NONE	FOUR	NO
1B3	DEFENSE	SIMUL	T72	1000-1400m	MOV	TROOPS	700-900	STA	NONE	FOUR	NO
1B4	OFFENSE	SINGLE	T72	1000-1400m	MOV	---	---	---	NONE	THREE	NO
1B5	OFFENSE	MULTIPLE	BMP	(900m	MOV	TROOPS	(900m	STA	B/S	FOUR	NO
1B6	DEFENSE	MULTIPLE	BMP	(900m	STA	BMP	(900m	MOV	NONE	FOUR	NO

E X E R C I S E T W O

TASK NO.	MISSION	TARGET ARRAY	TARGET NO. 1 TYPE	TARGET NO. 1 RANGE	TARGET NO. 1 MOVEMENT	TARGET NO. 2 TYPE	TARGET NO. 2 RANGE	TARGET NO. 2 MOVEMENT	DEGRADED MODE	NUMBER CREWMEN	NBC ENVIRON?
2A1	DEFENSE	SINGLE	M2	) 1500m	NOV	---	---	---	NONE	FOUR	NO
2A2	DEFENSE	MULTIPLE	BMP	) 1500m	STA	BMP	) 1500m	STA	NONE	FOUR	YES
2A3	OFFENSE	MULTIPLE	BMP	(900m	STA	BMP	(900m	NOV	B/S	FOUR	NO
2A4	OFFENSE	MULTIPLE	T72	1000-1400m	NOV	TROOPS	(900m	STA	NONE	THREE	NO
2A5	OFFENSE	MULTIPLE	BMP	) 900m	NOV	TROOPS	(900m	STA	NONE	FOUR	NO
2A6	DEFENSE	SIMUL	T72	1000-1400m	STA	TROOPS	(900m	STA	NONE	FOUR	NO
2B1	OFFENSE	MULTIPLE	BMP	(900m	NOV	BMP	(900m	NOV	NONE	FOUR	YES
2B2	DEFENSE	MULTIPLE	T72	) 1500m	NOV	T72	) 1500m	NOV	NONE	THREE	NO
2B3	DEFENSE	SIMUL	BMP	(900m	STA	TROOPS	(900m	STA	NONE	FOUR	NO
2B4	OFFENSE	MULTIPLE	M1	) 1500m	STA	M1	) 1500m	NOV	GAS	FOUR	NO
2B5	DEFENSE	MULTIPLE	BMP	1000-1400m	STA	BMP	1000-1400m	NOV	NONE	FOUR	NO
2B6	OFFENSE	SINGLE	T72	1000-1400m	STA	---	---	---	NONE	FOUR	NO

E X E R C I S E T H R E E

TASK NO.	MISSION	TARGET ARRAY	TARGET NO. 1 TYPE	TARGET NO. 1 RANGE	TARGET NO. 1 MOVEMENT	TARGET NO. 2 TYPE	TARGET NO. 2 RANGE	TARGET NO. 2 MOVEMENT	DEGRADED MODE	NUMBER CREWMEN	NBC ENVIRON?
3A1	OFFENSE	MULTIPLE	BMP	1000-1400m	MOV	TROOPS	< 900m	STA	NONE	FOUR	YES
3A2	DEFENSE	MULTIPLE	T72	> 1500 m	MOV	T72	> 1500m	MOV	NONE	THREE	NO
3A3	DEFENSE	SINGLE	BMP	< 900m	MOV	---	---	---	GAS	FOUR	NO
3A4	OFFENSE	MULTIPLE	M1	> 1500m	STA	M1	> 1500m	STA	NONE	FOUR	NO
3A5	OFFENSE	MULTIPLE	TROOPS	400-600	STA	TROOPS	700-900	STA	NONE	FOUR	NO
3A6	DEFENSE	SINGL	BMP	1000-1400m	STA	TROOPS	< 900m	STA	NONE	FOUR	NO
3B1	DEFENSE	SINGL	T72	1000-1400m	STA	TROOPS	< 900m	STA	NONE	FOUR	NO
3B2	DEFENSE	MULTIPLE	T72	> 1500m	STA	T72	> 1500m	MOV	NONE	FOUR	YES
3B3	OFFENSE	MULTIPLE	M2	< 900m	STA	M2	< 900m	MOV	NONE	FOUR	NO
3B4	DEFENSE	MULTIPLE	BMP	< 900m	MOV	BMP	< 900m	MOV	NONE	THREE	NO
3B5	OFFENSE	SINGLE	T72	1000-1400m	MOV	---	---	---	NONE	FOUR	NO
3B6	OFFENSE	MULTIPLE	BMP	> 1500m	MOV	TROOPS	< 900m	STA	B/S	FOUR	NO

E X E R C I S E F O U R

TASK NO.	MISSION	TARGET ARRAY	TARGET NO. 1 TYPE	TARGET NO. 1 RANGE	TARGET NO. 1 MOVEMENT	TARGET NO. 2 TYPE	TARGET NO. 2 RANGE	TARGET NO. 2 MOVEMENT	DEGRADED MODE	NUMBER CREWMEN	NBC ENVIRON?
4A1	DEFENSE	MULTIPLE	T72	1000-1400m	STA	T72	1000-1400m	MOV	B/S	FOUR	NO
4A2	DEFENSE	SIMUL	BMP	1000-1400m	STA	TROOPS	< 900m	STA	NONE	FOUR	NO
4A3	OFFENSE	MULTIPLE	TROOPS	400-600m	STA	TROOPS	700-900m	STA	NONE	FOUR	NO
4A4	OFFENSE	MULTIPLE	T72	> 1500m	STA	T72	> 1500m	STA	NONE	FOUR	YES
4A5	OFFENSE	MULTIPLE	M1	> 1500m	MOV	M1	> 1500m	MOV	NONE	FOUR	NO
4A6	OFFENSE	MULTIPLE	T72	> 1500m	STA	T72	> 1500m	MOV	NONE	FOUR	NO
4B1	DEFENSE	SINGLE	T72	> 1500m	STA	---	---	---	NONE	THREE	NO
4B2	DEFENSE	MULTIPLE	M2	1000-1400m	STA	M2	1000-1400m	STA	NONE	FOUR	NO
4B3	OFFENSE	MULTIPLE	BMP	< 900m	STA	TROOPS	< 900m	STA	NONE	FOUR	YES
4B4	OFFENSE	MULTIPLE	T72	1000-1400m	STA	T72	1000-1400m	MOV	NONE	FOUR	NO
4B5	DEFENSE	SINGLE	T72	1000-1400m	STA	---	---	---	GAS	FOUR	NO
4B6	DEFENSE	SINGLE	T72	> 1500m	MOV	---	---	---	NONE	FOUR	NO

APPENDIX 2 TO ANNEX B

EXAMPLE FILLED-OUT RECORD SHEET

The attached record sheet provides some example results from the day portion of Exercise 1A. The following paragraphs demonstrate how the data on the record sheet is interpreted.

Task 1. The results from the record sheet indicate that the crew hit the single target on the first round. Thus, opening time is equal to target engagement time. However, the array consisted of a friendly target. Thus, the crew was assessed crew cut number seven (firing at a friendly target).

Task 2. On the second task, the crew fired and missed on the first two rounds. The trainer's caret mark indicates that the crew returned to turret defilade at 7 seconds and returned to hull defilade at 17 seconds. After returning, they fired at and finally hit the first target followed by firing at and hitting the second target to end the engagement. The timed data indicates an opening time of 2 seconds and a total engagement time of 23 seconds. However, the tank was in turret defilade for 10 seconds resulting in a target exposure time of 13 seconds.

Task 3. The results indicate that the crew hit both targets on the first try. However, as indicated by the coded crew cut, the crew used the wrong main gun ammunition. Inspection of the detailed results indicate that the crew used the incorrect ammunition (Sabot instead of HEAT) to fire at the first target.

Task 4. The results for the simultaneous task indicate that the crew opened fire with the main gun and the caliber .50 at two seconds. The first main gun round missed the target on the first attempt, but the second round hit the target at four seconds. The engagement was completed when the caliber .50 killed the troops target at seven seconds.

Task 5. The outcome from this multiple engagement shows that both targets were destroyed with three rounds of Sabot within eight seconds. The crew cut indicates that the crew engaged the targets in the incorrect sequence. This error is also shown in the round-by-round results, which indicate that the crew fired first on the target that appeared second.

Task 6. The outcome of the multiple machine gun target engagement was that both targets were destroyed within 15 seconds. However, the crew cut code (14) indicates that the gunner fired before receiving "FIRE" from the TC or announcing "ON THE WAY." The trainer has included a notation that the latter failure was applicable.

Ammunition conservation. The example results indicate that the crew expended 9 rounds of Sabot, 3 rounds of HEAT, 75 rounds of 7.62mm ammunition, and 105 rounds of caliber .50 ammunition. According to the estimated ammunition conservation standards, the crew expended 4 rounds of Sabot and 25 rounds of Caliber .50 in excess of guidelines. (See Table 1, Annex B.)

RECORD SHEET

CREW GUNNERY PRACTICE EXERCISE 1A

TANK CREW: TC SSG JONES L PFC BROWN PLATOON 1st TANK C-1-2

G SGT SMITH D CPL EDWARDS COMPANY C DATE/TIME 1 JAN 1990/ 0800

Task	Special Conditions	Target(s) Priority	Type	Range	Movement	Accuracy/Ammunition 1	2	3	4	5	Crew Cut(s)
1A1. Engage single target from the defense		1st	M1	>1500m	MOV	H/S					Code 7
					Time	3					Other
1A2. Engage multiple targets from the defense	Computer/LRF failure (Use GAS)	1st	T72	>1500m	STA	M/S	M/S	H/S			Code
		2d	T72	>1500m	MOV				H/S		Other
					Time	2	5	19	23		
1A3. Engage multiple targets from the offense	NBC environment	1st	BMP	<900m	STA	H/S					Code
		2d	BMP	<900m	MOV		H/H				Other
					Time	3					

7 17

RECORD SHEET

CREW GUNNERY PRACTICE EXERCISE 1A

TANK C-1-2

Task	Special Conditions	Target(s) Priority	Type	Range	Movement	Accuracy/Ammunition 1	2	3	4	5	Crew Cut(s)
1A4. Engage simultaneous targets from the defense		1st	BMP	1000-1400m	STA	M/H	H/H				Code ____
		2d	TROOPS	<900m	STA	O/F		K/75			Other ____
					Time	2	4	7			
1A5. Engage multiple targets from the offense		1st	T72	>1500m	MOV		M/S	H/S			Code ____
		2d	T72	>1500m	MOV	H/S					Other ____
					Time	2	5	8			
1A6. Engage multiple targets from the offense	LDR dead (Three-man crew)	1st	TROOPS	400-600m	STA	O/C	K/75				Code 14 ("ON THE WAY")
		2d	TROOPS	700-900m	STA			O/C	K/30		Other ____
					Time	1	7	8	15		

PART II
PLATOON GUNNERY PRACTICE EXERCISES

The attached annexes present five sets of exercises whose purpose is to prepare platoons for gunnery qualifications on Table XII. The first set consists of a single exercise concerning prepare-to-fire procedures. It requires each crew within the platoon to prepare its tank for participation on Table XII. The remaining four sets of exercises consist of dry-fire gunnery engagements whose targets arrays are similar to or identical to those used for Table XII. These dry-fire exercises are intended to be executed on the Phantom Range using I-MILES to simulate gunnery effects and through-sight video (TSV) for measuring gunnery proficiency.

Prepare-to-Fire Exercise

The purpose of the Prepare-to-Fire Exercise is to present an opportunity for the platoon to practice preparing their tanks for Table XII. During the exercise, each crew within the platoon will perform pre-fire checks in accordance with the M1 Operator's Manual and will boresight the tank and the caliber .50 machine gun. Annex A presents detailed procedures and record sheets for the conduct of this exercise.

Defects. Prior to the exercise, the trainer will introduce ten defects for the crew to detect and correct during the pre-fire checks. Four of these defects will be introduced to ensure that the tank and the caliber .50 machine gun systems are out of boresight. IT IS IMPORTANT THAT THE CREW NOT KNOW THE SPECIFIC DEFECTS THAT ARE INTRODUCED NOR THE NUMBER OF DEFECTS.

Recording Performance. Although there are specific procedures for conducting pre-fire checks and for boresighting the tank, trainers will not be required to observe each step in these procedures. Instead, they will determine whether or not the defects had been corrected and whether or not the tank and caliber .50 machine gun had been properly boresighted. If any defects are not corrected or if the tank or caliber .50 machine gun is not properly boresighted, the trainer will ensure that these deficiencies are corrected before the start of the dry-fire exercises.

Dry-Fire Exercises

Like Table XII, the dry-fire portion of the Platoon Gunnery Practice Exercises consist of four engagements--an offensive engagement to be fired during the day, an offensive engagement to be fired at night, a defensive engagement to be fired during the day, and a defensive engagement to be fired at night. There are four versions of each engagement. Each version contains the same target arrays used in Table XII. The versions differ only in the sequence in which the target arrays appear. During each of the first three exercises (i.e., Exercise A, Exercise B, and Exercise C), the target arrays will appear in a different random order. During the fourth exercise (Exercise D), the targets will appear in the order specified for Table XII. Like the target arrays for Table XII, the exercises specify a wide band of ranges to account for terrain and target placement constraints. A description of the target arrays and the order in which the arrays appear in each of the four exercises are listed in Appendix 1 of Annex B.

Recording Performance. In contrast to Table XII, the purpose of recording performance in the present dry-fire exercises is not to determine platoon qualification. Rather, the purpose is to identify the exact nature of performance deficiencies so that trainers can provide appropriate diagnoses and corrective actions to the platoons. Thus, the present approach to recording performance emphasizes collecting raw data as opposed to aggregating data into a single composite.

Performance Measures. Table XII contains two types of performance measures--target hits and tactical proficiency. In addition, standards for engagement times are presented, but no scoring procedures are specified. Since engagement time is available on the I-MILES printout, it will be used as one of the performance measures. Target hits will be obtained from a review of TSV results since performance feedback from MILES is inexact. It will therefore not be necessary for trainers to record target hits during the engagements. Tactical proficiency is scored on Table XII by scorers who assign points in four categories of tactical performance. Since the purpose of the dry-fire exercises is to allow the trainer to identify the need for corrective actions, trainers will describe errors in tactical performance rather than assign scores based on platoon performance. Errors will be reported for each of the four catagories in which tactical proficiency points are awarded in Table XII--fire commands, fire distribution/control, tactical movement, and tactical reporting.

Record Sheets. Four record sheets are required for the dry-fire exercises, one for each set of engagements (e.g., day offense, night defense). The record sheet for night offense is contained in Appendix 2 of Annex B. Before using the record sheet, the trainer should enter the target number alongside each engagement. The target number should be obtained from the informtion provided in Appendix 1 of Annex B. Enagement times should be entered on the record sheet after the exercise is completed using information contained on the I-MILES printouts. Target hits are to be recorded after the exercise is completed using the TSV results. Tactical errors are to be recorded as they occur.

ANNEX A

PREPARE-TO-FIRE EXERCISE

The purpose of the Prepare-to-Fire Exercise is to present an opportunity for the platoon to practice preparing their tanks for Table XII. During the exercise, each crew in the platoon will perform pre-fire checks and will boresight the tank and the caliber .50 machinegun. Prior to the start of the exercise, the trainer will select 10 defects from the list presented in Appendix I and will introduce these defects into the each crew's tank. A set of different defects should be selected for each tank. The crews will then be told to perform pre-fire checks and to boresight the tank and caliber .50 machinegun. At the end of the exercise, the trainer will determine if the defects have been corrected and if the tank and caliber .50 machinegun are properly boresighted.

Defects

The following table contains 27 defects which are organized into nine clusters. Prior to the start of the Prepare-to-Fire exercise, the trainer should select 10 defects from the list and introduce them into the tank that will be used by the crew conducting the exercise. Two of the defects should be selected from the BORESIGHT M1 TANK cluster and two should be selected from the BORESIGHT CALIBER .50 MACHINEGUN cluster. The remaining six defects should be chosen from the remaining seven clusters, but no more than two defects should be selected from any one cluster. IT IS IMPORTANT THAT THE CREW NOT KNOW THE SPECIFIC DEFECTS THAT ARE INTRODUCED NOR THE NUMBER OF DEFECTS.

Procedure

The trainer should introduce the 10 defects prior to the start of the exercise. Once the defects are introduced, the trainer should direct the Tank Commander of the crew to perform prepare-to-fire checks and to boresight the tank and caliber .50 machinegun. When the crew complete these activities, the trainer should inspect the vehicle to determine whether or not each of the defects had been corrected and to determine whether or not the main gun and .50 caliber machinegun had been properly boresighted. The trainer should record the results of his inspection on the record sheet contained in Appendix II.

After recording the performance of the crews during the exercise, the trainer should provide feedback to each crew by telling them which defects were corrected and which defects were not and whether or not the tank and caliber .50 machinegun were properly boresighted. The trainer must then make sure that all defects are corrected and that the tank and caliber .50 machinegun are properly boresighted before conducting the dry-fire exercises.

APPENDIX 1 TO ANNEX A

DEFECTS FOR PREPARE-TO-FIRE EXERCISE

OPERATE GUNNER'S PRIMARY SIGHT (GPS)

1. Obscure Unity Window
2. Place FIRE CONTROL MODE switch in EMER
3. Place Spent Case Ejection Guard in ARMED
4. Obscure Gunner's Primary Sight (GPS)
5. Place GUN/TURRET DRIVE switch in POWERED
6. Place GUN SELECT switch in MAIN

CHECKOUT THERMAL IMAGERY SIGHT (TIS)

7. Place THERMAL MODE switch in STBY
8. Place Test Pattern switch in TRU

OPERATE GUNNER'S AUXILIARY SIGHT (GAS)

9. Obscure Gunner's Auxiliary Sight (GAS)
10. Place Filter Switch in IN
11. Place Ammo Switch in HEAT

COMMANDER'S PRIMARY SIGHT EXTENSION (GPSE)

12. Obscure Commander's Primary Sight Extension

CROSSWIND SENSOR CHECK

13. Place CROSSWIND key light ON

COMPUTER DATA CHECK

14. Place GUN SELECT switch in COAX
15. Move MRS lever to IN

FIRING CIRCUIT TEST

16. Place Spend Case Ejection Guard in ARMED
17. Place Turret in LOCK
18. Place Elevation in LOCK

BORESIGHT M1 TANK

19. Set GPS reticle Off of Vertical Alignment of Aim Point
20. Set GPS reticle off of Horizontal Alignment of Aim Point
21. Slip GAS scales to 2 and 3
22. Set TIS reticle off of aim point
23. Place FLTR/CLEAR/SHTR switch in FLTR

BORESIGHT CALIBER .50 MACHINEGUN

24. Set Headspace Off
25. Place SAFE to FIRE switch (on MAN ELEV handle) in FIRE
26. Loosen Azi/Elev set screws
27. Remove Reticle Boresight Cross Off of Top Left Corner of Target

APPENDIX 2 TO ANNEX A

RECORD SHEET FOR PREPARE-TO-FIRE EXERCISE

CREW #:_____ TANK COMMANDER:_____ DATE_____

	DEFECT INTRODUCED		DEFECT CORRECTED	
	YES	NO	YES	NO
OPERATE GUNNER'S PRIMARY SIGHT				
1. Unity Window	___	___	___	___
2. Fire Control Mode	___	___	___	___
3. Spent Case Ejection Guard	___	___	___	___
4. Gunner's Primary Sight	___	___	___	___
5. Gun/Turret Drive	___	___	___	___
6. Gun Select Switch	___	___	___	___
CHECKOUT TIS				
7. Thermal Mode Switch	___	___	___	___
8. Test Pattern Switch	___	___	___	___
OPERATE GAS				
9. Gunner's Auxiliary Sight	___	___	___	___
10. Filter Switch	___	___	___	___
11. Ammo Switch	___	___	___	___
12. Gunner's Primary Sight Ext.	___	___	___	___
CROSSWIND SENSOR				
13. Crosswind Key Light	___	___	___	___
COMPUTER DATA CHECK				
14. Gun Select	___	___	___	___
15. MRS Lever	___	___	___	___

	DEFECT INTRODUCED		DEFECT CORRECTED	
	YES	NO	YES	NO
FIRING CIRCUIT TEST				
16. Spent Case Ejection Guard	____	____	____	____
17. Turret	____	____	____	____
18. Elevation	____	____	____	____
BORESIGHT M1 TANK				
19. GPS Reticle (Vertical)	____	____	____	____
20. GPS Reticle (Horizontal)	____	____	____	____
21. GAS Scales	____	____	____	____
22. TIS Reticle	____	____	____	____
23. FLTR/CLEAR/SHTR Switch	____	____	____	____
BORESIGHT CALIBER .50 MACHINEGUN				
24. Headspace	____	____	____	____
25. SAFE Switch	____	____	____	____
26. Azi/Elev Screws	____	____	____	____
27. Reticle Boresight Cross	____	____	____	____

Trainer: All defects must be corrected before this vehicle can be used in the dry-fire exercises. Sign in the space below when you have confirmed that all defects have been corrected.

_____
Trainer's Signature

ANNEX B

DRY-FIRE GUNNERY EXERCISES

The purpose of the Dry-Fire Gunnery Exercises is to present an opportunity for tank platoons to prepare for participation on Table XII. There are four exercises that are similar to Table XII except that I-MILES is used to simulate gunnery effects and thru-sight video (TSV) is used to measure gunnery proficiency. Each exercise has four phases corresponding to the Table XII phases--a day offense phase, a night offense phase, a day defense phase, and a night defense phase.

Target Arrays. The platoon will engage five different target arrays during each day phase of an exercise and six different target arrays during the night phase of an exercise. The sixth target in the night phases represent the alternate target in Table XII. The target arrays are identical to those presented in Table XII. The exercises differ only in the sequence in which the target arrays will appear. The target arrays and their sequence in each exercise are presented in Appendix I. The target arrays appear in a random sequence in Exercises A, B, and C. The target arrays in Exercise D appear in the same sequence in which they appear in Table XII.

Record Sheets. The record sheet for the night offense phase is contained in Appendix 2 as an example of the record sheets that are to be used in the four dry-fire exercises.

APPENDIX 1 TO ANNEX B

TARGET SEQUENCES FOR PLATOON GUNNERY PRACTICE EXERCISES A, B, C AND D

TARGET ARRAY DESCRIPTION	TARGET ARRAY SEQUENCE			
	EX. A	EX. B	EX. C	EX. D
DAY OFFENSE PHASE				
4S-BMP's, 1,000-1,400 meters 1S-ATGM Tm, 600-800 meters	1	4	5	1
2S-T72s, 1,000-1,200 meters 2S-BTR-70s, 1,000-1200 meters	3	2	4	2
2M-T72s. 1,000-1,200 meters 8S-T72s, 1,200-1,400 meters	4	5	1	3
4S-T72s, 1,200-1,400 meters 2S-ATGM Tms, 800-900 meters 2S-AT Guns, 1,000-1,200 meters	5	1	3	4
3S-T72s, 1,400-1,600 meters (NBC environment)	2	3	2	5
NIGHT DEFENSE PHASE				
10S-T72s, 1,600-2,100 meters	4	4	3	1
3S-T72s, 1,200-1,400 meters 2M-BMPs, 1,200-1,400 meters	5	6	2	2
2S-T72s, 1,200-1,400 meters 2M-T72s, 1,200-1,400 meters	6	5	1	3
2M-T72s, 1,200-1,400 meters 4S-Sets Trps, 800-900 meters	1	2	5	4
3S-T72s, 800-1,200 meters 2S-ATGM Tms, 800-1,000 meters (GPS, Illum, PRECISION, TIS failure.)	3	1	6	5
3S-T72s, 800-1,000 meters 2S-ATGM Tms, 800-1,000 meters	2	3	4	6

TARGET SEQUENCES FOR PLATOON GUNNERY PRACTICE EXERCISES A, B, C AND D

TARGET ARRAY DESCRIPTION	TARGET ARRAY SEQUENCE			
	EX. A	EX. B	EX. C	EX. D
DAY DEFENSE PHASE				
10S-T72s, 1,600-2,100 meters	5	4	1	1
3S-T72s, 1,200-1,400 meters 2M-BMPs, 1,200-1,400 meters 1S-Set Trps, 800-1,000 meters	3	1	4	2
2S-BMPs, 1,200-1,400 meters 2M-T72s,1,200-1,400 meters 2S-BTRs, 1,000-1,200 meters	2	3	5	3
2M-T72s, 1,200-1,400 4S-Sets Trps, 800-1,000 meters	1	5	2	4
3S-T72s, 800-1,000 meters 2S-AT Guns, 800-1,000 meters (NBC environment)	4	2	3	5
NIGHT OFFENSE PHASE				
4S-BMPs. 1,000-1,400 meters 1S-ATGM Tm, 600-800 meters	2	4	6	1
2S-T72s, 1,000-1,200 meters	3	5	2	2
2M-T72s, 800-1,000 meters 8S-T72s, 1,200-1,400 meters	6	2	5	3
4S-T72s, 1,200-1,400 meters 3S-ATGM Tms, 800-900 meters	5	1	3	4
3S-T72s, 1,400-1,600 meters (GPS, illum, PRECISION, TIS Failure.)	4	5	1	5
3S-T72s, 800-1,000 meters	1	3	4	6

APPENDIX 2 TO ANNEX B

RECORD SHEET

PLATOON GUNNERY PRACTICE EXERCISE (OFFENSE-NIGHT)

TANK CREW 1: TC _____	TANK CREW 2: TC _____	TANK CREW 3: TC _____	TANK CREW 4: TC _____	DATE/TIME _____
G _____	G _____	G _____	G _____	PLATOON _____
L _____	L _____	L _____	L _____	COMPANY _____
D _____	D _____	D _____	D _____	BATTALION _____
BUMPER NO. _____	BUMPER NO. _____	BUMPER NO. _____	BUMPER NO. _____	

TARGET NUMBER	CONDITIONS TARGETS/SITUATION	ENGAGEMENT COMPLETION TIME	CIRCLE TARGET HITS/COVERAGE	TACTICAL ERRORS
_____	4 stationary BMPs, 1,000-1,400m. 1 ATGM team, 600-800m.	_____ seconds (Std: 30 seconds)	0 1 3 4 5	Fire Commands _____ Fire Distribution/Control _____ Tactical Movement _____ Tactical Reporting _____
_____	2 stationary T-72s, 1,000-1,200m.	_____ seconds) (Std: 15 seconds)	0 1 2	Fire Commands _____ Fire Distribution/Control _____ Tactical Movement _____ Tactical Reporting _____
_____	2 moving T-72s, 800-1,000m 8 stationary T-72s, 1,200-1,400m.	_____ seconds (Std: 55 seconds)	0 6 1 7 2 8 3 9 4 10 5	Fire Commands _____ Fire Distribution/Control _____ Tactical Movement _____ Tactical Reporting _____

RECORD SHEET

PLATOON GUNNERY PRACTICE EXERCISE
(OFFENSE-NIGHT)

PLATOON _____

TARGET NUMBER	CONDITIONS TARGETS/SITUATION	ENGAGEMENT COMPLETION TIME	CIRCLE TARGET HITS/COVERAGE		TACTICAL ERRORS
_____	4 stationary T-72s, 1,200-1,400m. 3 ATGM teams, 800-900m.	_____ seconds (Std: 40 seconds)	0	4	Fire Commands _____
			1	5	Fire Distribution/Control _____
			2	6	Tactical Movement _____
			3	7	Tactical Reporting _____
_____	3 stationary T-72s, 1,400-1,600m. Using GPS with illumination, PRECISION. TIS failure.	_____ seconds (Std: 20 seconds)	0		Fire Commands _____
			1		Fire Distribution/Control _____
			2		Tactical Movement _____
			3		Tactical Reporting _____
_____	3 stationary T-72s, 1,000-1,200m.	_____ seconds (Std: 20 seconds)	0		Fire Commands _____
			1		Fire Distribution/Control _____
			2		Tactical Movement _____
			3		Tactical Reporting _____

Working Paper

WP FTKNOX 89-1

Analysis of U.S. Army Enlisted Military Occupational Specialties (MOSs) for Rapid Train-Up (RTUP) Application: Detailed MOS Study Data By U.S. Army Service Schools.

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ANALYSIS OF U.S. ARMY ENLISTED MILITARY OCCUPATIONAL SPECIALTIES (MOSs) FOR RAPID TRAIN-UP PROGRAM (RTUP) APPLICATION: DETAILED MOS STUDY DATA BY U.S. ARMY SERVICE SCHOOLS

CONTENTS

		Page
INTRODUCTION		1
APPENDIX A.	U.S. ARMY AIR DEFENSE ARTILLERY SCHOOL	A-1
B.	U.S. ARMY ARMOR SCHOOL	B-1
C.	U.S. ARMY AVIATION CENTER	C-1
D.	U.S. ARMY CHAPLAIN CENTER AND SCHOOL	D-1
E.	U.S. ARMY CHEMICAL SCHOOL	E-1
F.	U.S. ARMY ENGINEER SCHOOL	F-1
G.	U.S. ARMY FIELD ARTILLERY SCHOOL	G-1
H.	U.S. ARMY INFANTRY SCHOOL	H-1
I.	U.S. ARMY INTELLIGENCE CENTER AND SCHOOL	I-1
J.	U.S. ARMY INTELLIGENCE SCHOOL	J-1
K.	U.S. ARMY MILITARY POLICE SCHOOL	K-1
L.	U.S. ARMY ORDNANCE CENTER AND SCHOOL	L-1
M.	U.S. ARMY QUARTERMASTER SCHOOL	M-1
N.	U.S. ARMY SIGNAL CENTER AND FORT GORDON	N-1
O.	U.S. ARMY SOLDIER SUPPORT CENTER	O-1

ANALYSIS OF U.S. ARMY ENLISTED MILITARY OCCUPATIONAL SPECIALTIES (MOSs) FOR RAPID TRAIN-UP PROGRAM (RTUP) APPLICATION: DETAILED MOS STUDY DATA BY U.S. ARMY SERVICE SCHOOLS

INTRODUCTION

The U.S. Army Research Institute (ARI) Field Unit at Fort Knox is responsible for conducting research and development designed to maximize training readiness. On request for Technical Advisory Service (TAS) by the Deputy Commanding General for Training (DCGST), Training and Doctrine Command (TRADOC), and the President, U.S. Army Training Board (USATB), ARI investigated the suitablility of using a Rapid Train-up Program (RTUP) methodology to train Individual Ready Reserve (IRR) soldiers called to active military duty in the event of mobilization.

This report contains the individual and collective judgments of Subject Matter Expert (SMEs) from 14 U.S. Army Service Centers and Schools. For each enlisted MOS, it identifies their judgments of (a) skill level 1 tasks considered highly critical for combat, (b) highly critical combat tasks suitable for a RTUP using a procedure guide, (c) highly critical combat tasks suitable for a RTUP using a training guide, and (d) estimates of average time to train tasks to standard using a training guide, and (e) highly critical combat tasks that should be part of a RTUP but do not require training materials.

Detailed analysis of the consensus judgments of SMEs regarding the RTUP methodology has been completed and are reported in a separate ARI Research Report titled: "Analysis of U.S. Army Enlisted Military Occupational Specialties (MOSs) for Rapid Train-up Program (RTUP) Application."

The research findings have been presented to the President, USATB. These findings will be used to supplement information being gathered in other TRADOC efforts underway to develop an IRR training strategy and in formulating requirements for IRR mobilization training.

Working Paper

WP FTKNOX 88-1

Appendices to Impact of Excellence in Armor Program on Soldier Performance in One Station Unit Training

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DAAL03-86-D-0001

September 1988

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APPENDICES TO IMPACT OF EXCELLENCE IN ARMOR PROGRAM ON SOLDIER PERFORMANCE IN ONE STATION UNIT TRAINING

By

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18 September 1988

APPENDICES TO IMPACT OF EXCELLENCE IN ARMOR PROGRAM ON SOLDIER PERFORMANCE IN OSUT

CONTENTS

		Page
Appendix A:	Gate III - Modified Score sheets and Rating Scale Definitions.	A-1
Appendix B:	Military Stakes Simulation: Station 4 - Identify Friendly and Threat Armored Vehicles.	B-1
Appendix C:	Military Stakes Simulation: Station 6 - Visually Identify Threat Aircraft	C-1
Appendix D:	NT Paper and Pencil Knowledge Test.	D-1
Appendix E:	TCGST Simulation: Station 5 - Remove, Disassemble, and Install the M68 Breechblock	E-1
Appendix F:	TCGST Simulation: Station 14 - Issue Initial and Subsequent Fire Commands.	F-1
Appendix G:	TCGST Simulation: Station 16 - Estimate and Determine Range to a Target. . .	G-1
Appendix H:	TCGST Modified Score Sheets and Rating Scale Definitions.	H-1

Appendix A

Gate III - Modified Score Sheets and Rating Scale Definitions

BASIC ARMOR TEST GATE III 19K (Version A)

ROSTER # _____

NAME _____ RANK _____ UNIT _____ DATE _____

	TASK	1ST TIME	INIT	1st	2d	3d	4th	FAMILIARITY WITH TRAINING MANUAL	REMARKS
STATION 1	- DRIVER'S STATION								
171-126-1007	Prepare Driver's Station								
171-126-1052	Operate the Gas Particulate Filter Unit on an M1/M1A1 Tank								
171-126-1041	Extinguish a Fire on an M1/M1A1 Tank								
171-126-1008	Secure Driver's Station								
STATION 2	- LOADER'S STATION								
171-126-1023	Prepare Loader's Station for Operation								
171-122-1017	Install the M240 Loader's Machinegun on an M1/M1A1 Tank								
113-622-2006	Operate Intercommunication Set AN/VIC-1 in an M1/M1A1 Tank								
171-126-1038	Stow Ammunition on an M1 Tank								
171-126-1026	Load/Unload the 105mm Main Gun on an M1/M1A1 Tank	UNLOAD / LOAD							
171-126-1027	Load/Unload the M250 Grenade Launcher								
171-126-1024	Secure Loader's Station								
171-122-1017	Remove the M240 Loader's Machinegun on an M1/M1A1 Tank								
STATION 3	- GUNNER'S STATION								
171-126-1029	Prepare Gunner's Station for Operation								
171-122-1011	Install an M240 Coax Machine-gun on an M1/M1A1 Tank								
171-126-1030	Secure Gunner's Station on an M1/M1A1 Tank								
171-122-1011	Remove an M240 Coax Machinegun on an M1 Tank								

1 2 3 4 5
NOT FAMILIAR — EXTREMELY FAMILIAR

ADDITIONAL REMARKS _____

DEFINITION OF SCALE VALUES:
FAMILIARITY WITH THE TRAINING MANUAL

5 - EXTREMELY FAMILIAR
- This soldier KNOWS THE TM VERY WELL; he has studied it thoroughly and has a COMPLETE UNDERSTANDING of how to use the manual. A soldier with this level of familiarity KNOWS EXACTLY WHERE TO TURN IN THE TM to find the needed information although he DOES NOT NEED TO USE THE TM to perform the task. He ALWAYS COMPLETES SEVERAL STEPS IN SEQUENCE BEFORE GLANCING AT THE TM.

4

3 - SOMEWHAT FAMILIAR
- This soldier has KNOWLEDGE OF THE TM; he has studied the TM and has an UNDERSTANDING OF HOW TO USE THE TM. A soldier with this level of familiarity KNOWS THE GENERAL SECTION IN THE TM that contains the needed information and is able to COMPLETE ONE OR TWO STEPS IN SEQUENCE before needing to refer to the TM.

2

1 - NOT FAMILIAR
- This soldier has LIMITED KNOWLEDGE of the TM and LIMITED UNDERSTANDING of how to use the manual. A soldier with this level of familiarity NEEDS TO CHECK THE TM AFTER PERFORMING ONLY ONE OR TWO STEPS IN SEQUENCE and NEEDS PROMPTING to complete steps in sequence.

Appendix B

Military Stakes Simulation:
Station 4 - Identify Friendly and Threat Armored Vehicles

VISUALLY IDENTIFY FRIENDLY AND THREAT ARMORED VEHICLES

INSTRUCTIONS:

You will be tested on your ability to visually identify friendly and threat armored vehicles. You will have 5 seconds to view each picture to determine the type of vehicle. You will then turn to the colored divider sheet between the questions and be allowed time to record your answer on your answer sheet. Do NOT continue to the next question until you are told to do so.

You must write No Kill or "NK" if the vehicle in the picture is friendly and Kill or "K" if the vehicle in the picture is threat.

At this time print your name, company, SOCIAL SECURITY NUMBER, and today's date on your answer sheet.

Do you have any questions concerning the administration of this test?

DO NOT TURN THE PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

1. At the signal, you may turn the page and view the first vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

2. At the signal, you may turn the page and view the second vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS.)

3. At the signal, you may turn the page and view the third vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

4. At the signal, you may turn the page and view the fourth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

5. At the signal, you may turn the page and view the fifth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

6. At the signal, you may turn the page and view the sixth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

7. At the signal, you may turn the page and view the seventh vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

8. At the signal, you may turn the page and view the eighth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

9. At the signal, you may turn the page and view the ninth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

10. At the signal, you may turn the page and view the tenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

11. At the signal, you may turn the page and view the eleventh vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

12. At the signal, you may turn the page and view the twelfth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

13. At the signal, you may turn the page and view the thirteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

14. At the signal, you may turn the page and view the fourteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

15. At the signal, you may turn the page and view the fifteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 SECS)

16. At the signal, you may turn the page and view the sixteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

17. At the signal, you may turn the page and view the seventeenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

18. At the signal, you may turn the page and view the eighteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

19. At the signal, you may turn the page and view the nineteenth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

20. At the signal, you may turn the page and view the twentieth vehicle.

READY, BEGIN.

(5 secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWERS ON THE ANSWER SHEET. (10 secs)

NAME: KEY

COMPANY: _____

DATE: _____

(1) Indicate whether the vehicle is either FRIENDLY (NK) or THREAT (K).

	NK/K		NK/K
1.	NK	11.	NK
2.	K	12.	K
3.	K	13.	K
4.	NK	14.	NK
5.	K	15.	NK
6.	NK	16.	K
7.	K	17.	NK
8.	NK	18.	K
9.	NK	19.	NK
10.	K	20.	K

NAME: _____

COMPANY: _____

DATE: _____

(1) Indicate whether the vehicle is either FRIENDLY (NK) or THREAT (K).

	NK/K		NK/K
1.	_____	11.	_____
2.	_____	12.	_____
3.	_____	13.	_____
4.	_____	14.	_____
5.	_____	15.	_____
6.	_____	16.	_____
7.	_____	17.	_____
8.	_____	18.	_____
9.	_____	19.	_____
10.	_____	20.	_____

VISUALLY IDENTIFY FRIENDLY AND THREAT ARMORED VEHICLES

INSTRUCTIONS:

You will be tested on your ability to visually identify friendly and threat armored vehicles. You will have 5 seconds to view each picture to determine the type of vehicle. You will then turn to the colored divider sheet between the questions and be allowed time to record your answer on your answer sheet. Do NOT continue to the next question until you are told to do so.

1. You must write No Kill or "NK" if the vehicle in the picture is friendly and Kill or "K" if the vehicle in the picture is threat.

2. You must then write the numerical designation or standard NATO reporting name for each vehicle.

At this time print your name, company, and today's date on your answer sheet.

Do you have any questions concerning the administration of this test?

DO NOT TURN THE PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

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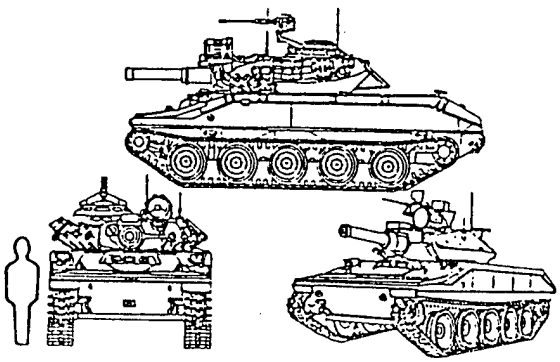

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Do NOT turn the page
until you are instructed to do so.

Do NOT turn the page
until you are instructed to do so.

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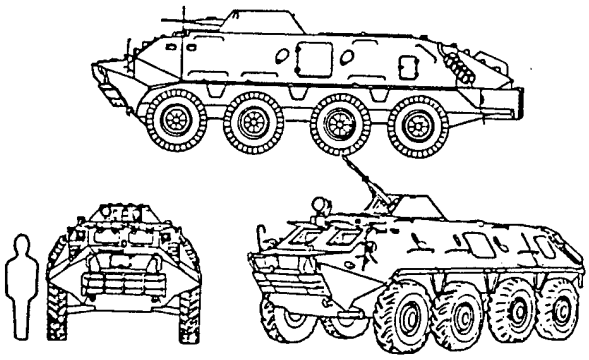

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until you are instructed to do so.

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until you are instructed to do so.

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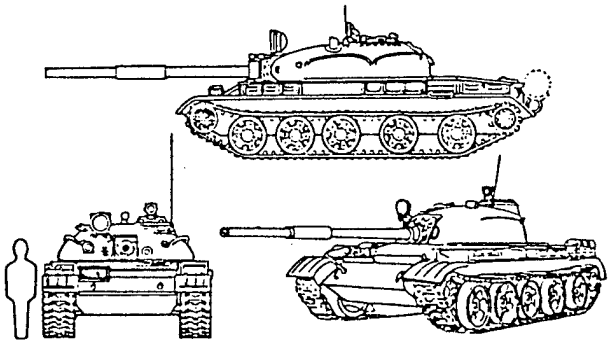

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until you are instructed to do so.

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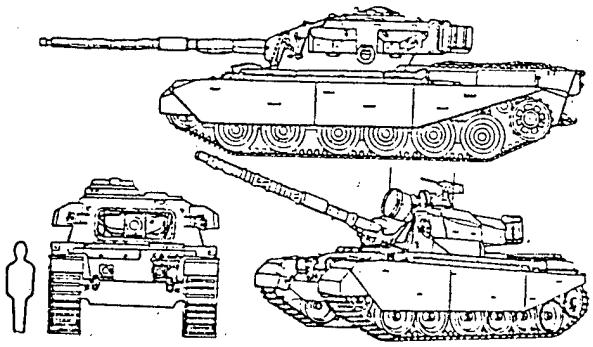

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until you are instructed to do so.

Do NOT turn the page
until you are instructed to do so.

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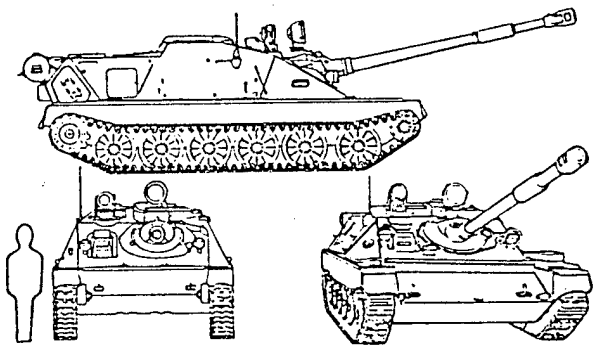

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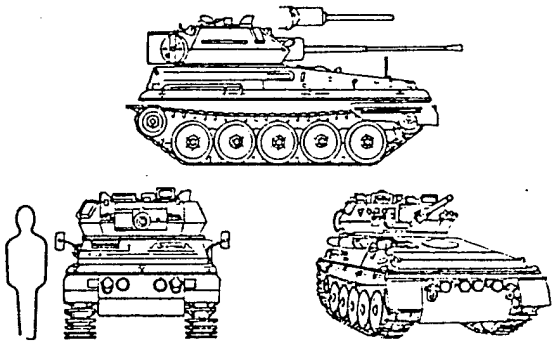

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Do NOT turn the page
until you are instructed to do so.

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until you are instructed to do so.

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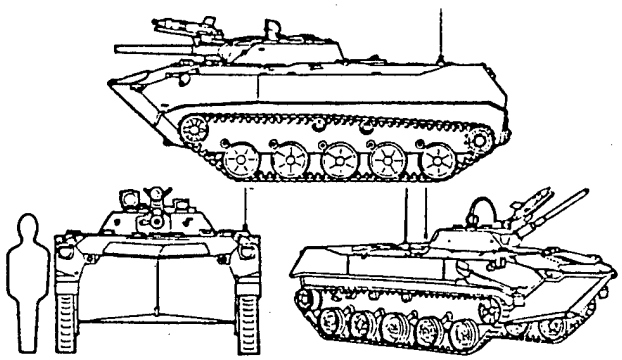

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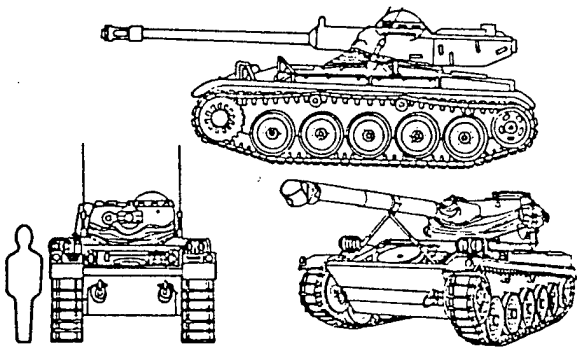

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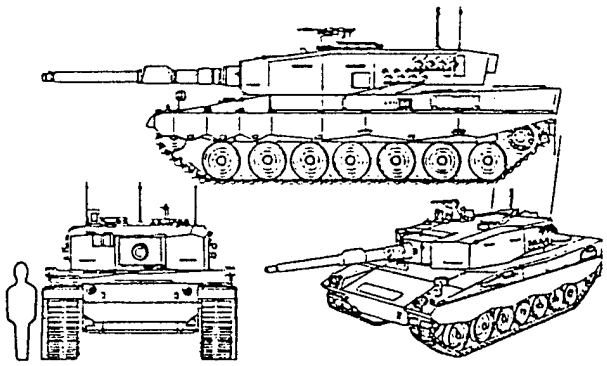

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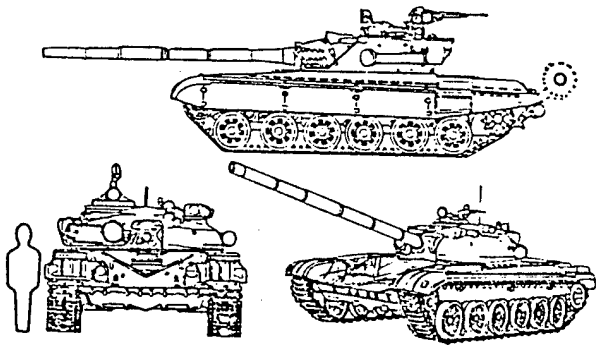

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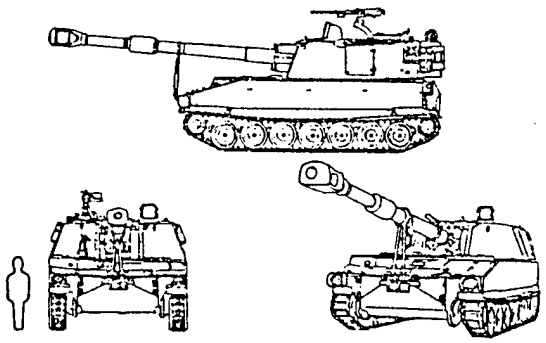

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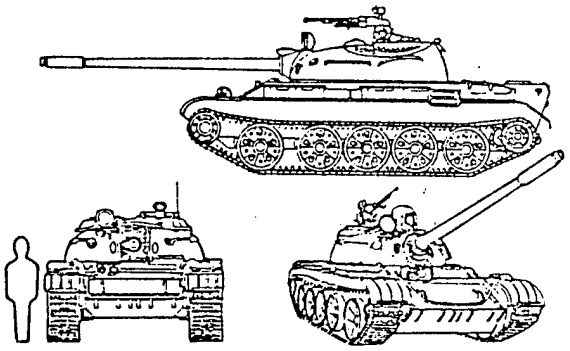

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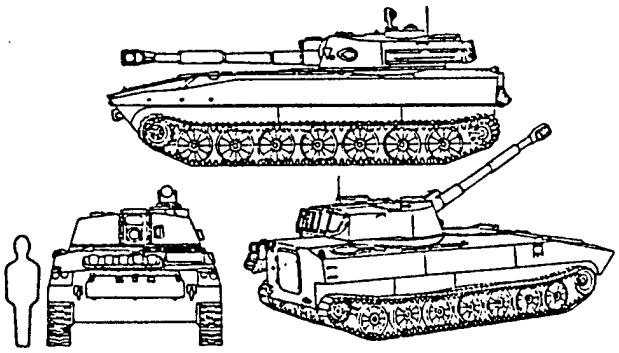

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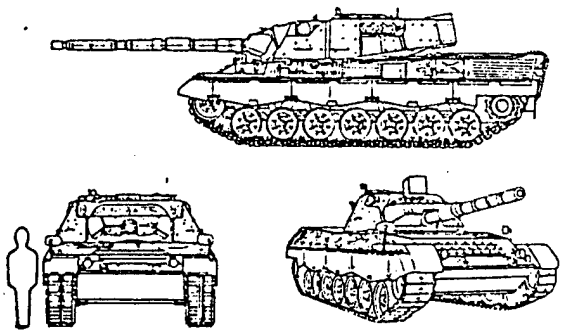

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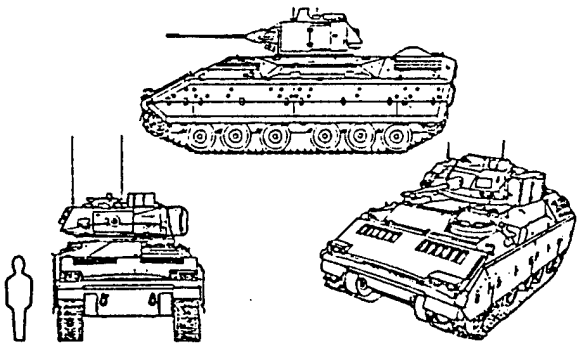

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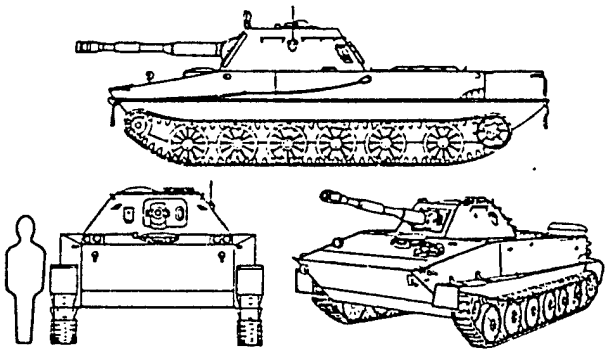

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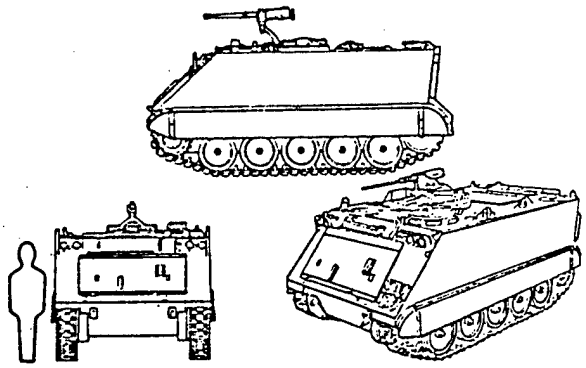

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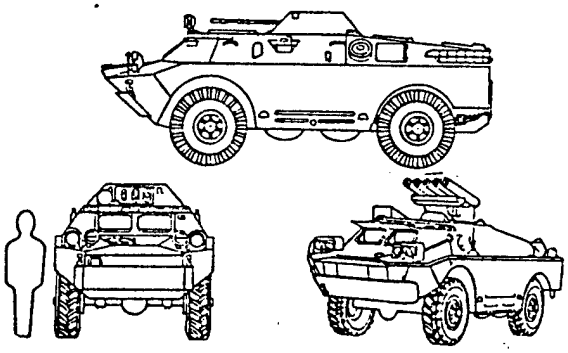

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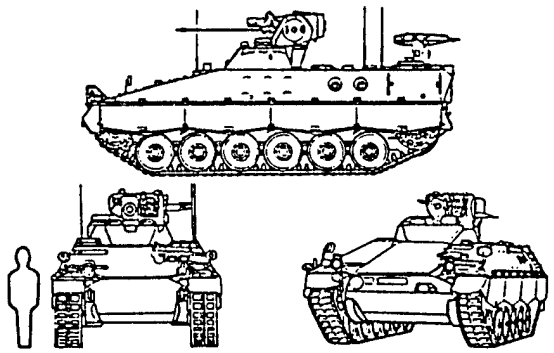

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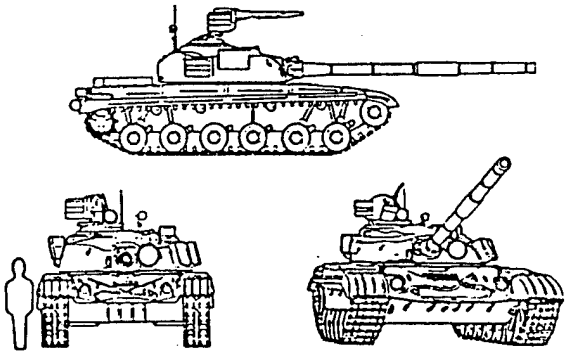

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Appendix C

Military Stakes Simulation:
Station 6 - Visually Identify Threat Aircraft

VISUALLY IDENTIFY POTE AL THREAT AIRCRAFT

INSTRUCTIONS:

You will be tested on your ability to visually identify potential threat aircraft. You will have 5 seconds to view each picture to determine the type of aircraft. You will then turn to the colored divider sheet between the questions and be allowed (10secs) time to record your answer on your answer sheet. Do NOT continue to the next question until you are told to do so. You must write the numerical designation or standard NATO reporting name for each aircraft. At this time print your name, company, and today's date on your answer sheet. + SSN

Do you have any questions concerning the administration of this test?

1. At the signal, you may turn the page and view the first aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 secs)

2. At the signal, you may turn the page and view the second aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 secs)

3. At the signal, you may turn the page and view the third aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 secs)

4. At the signal, you may turn the page and view the fourth aircraft.

READY. BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 secs)

5. At the signal, you may turn t page and view the fifth aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 SECS)

6. At the signal, you may turn the page and view the sixth aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 SECS)

7. At the signal, you may turn the page and view the seventh aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 SECS)

8. At the signal, you may turn the page and view the eighth aircraft.

READY, BEGIN.

(5secs.) STOP! TURN THE PAGE TO THE COLORED DIVIDER AND RECORD YOUR ANSWER ON THE ANSWER SHEET. (10 SECS)

NAME: KEY

COMPANY: _____

DATE: _____

Record the numerical designation or standard NATO reporting name for each aircraft. 3

1. MIG-21 FISHBED
2. Mi-24 HIND (A OR D)
3. Mi-4 HOUND
4. MIG-23 FLOGGER
5. MIG-19 FARMER
6. Mi-8 HIP
7. MIG 17 FRESCO
8. SU-7 FITTER

NAME: _____

COMPANY: _____

DATE: _____

Record the numerical designation or standard NATO reporting name for each aircraft.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

VISUALLY IDENTIFY POTENTIAL THREAT AIRCRAFT

INSTRUCTIONS:

You will be tested on your ability to visually identify potential threat aircraft. You will have 5 seconds to view each picture to determine the type of aircraft. You will then turn to the colored divider sheet between the questions and be allowed time to record your answer on your answer sheet. Do NOT continue to the next question until you are told to do so. You must write the numerical designation or standard NATO reporting name for each aircraft. At this time print your name, company, and today's date on your answer sheet.

Do you have any questions concerning the administration of this test?

DO NOT TURN THE PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

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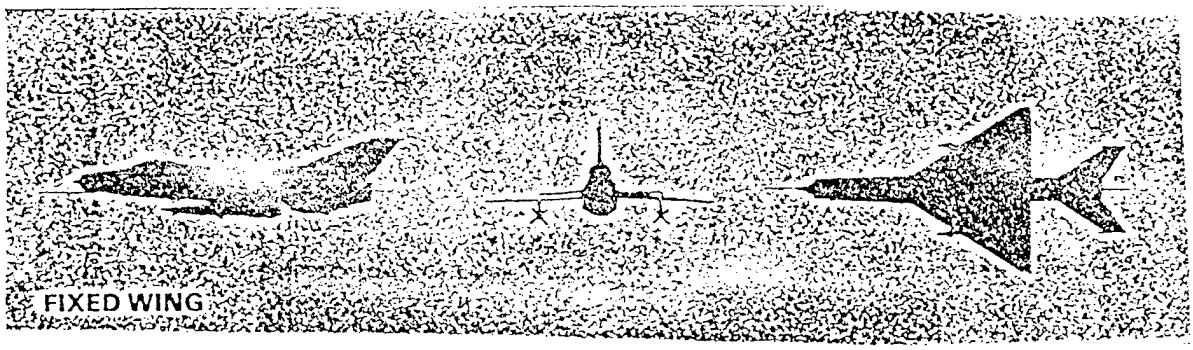

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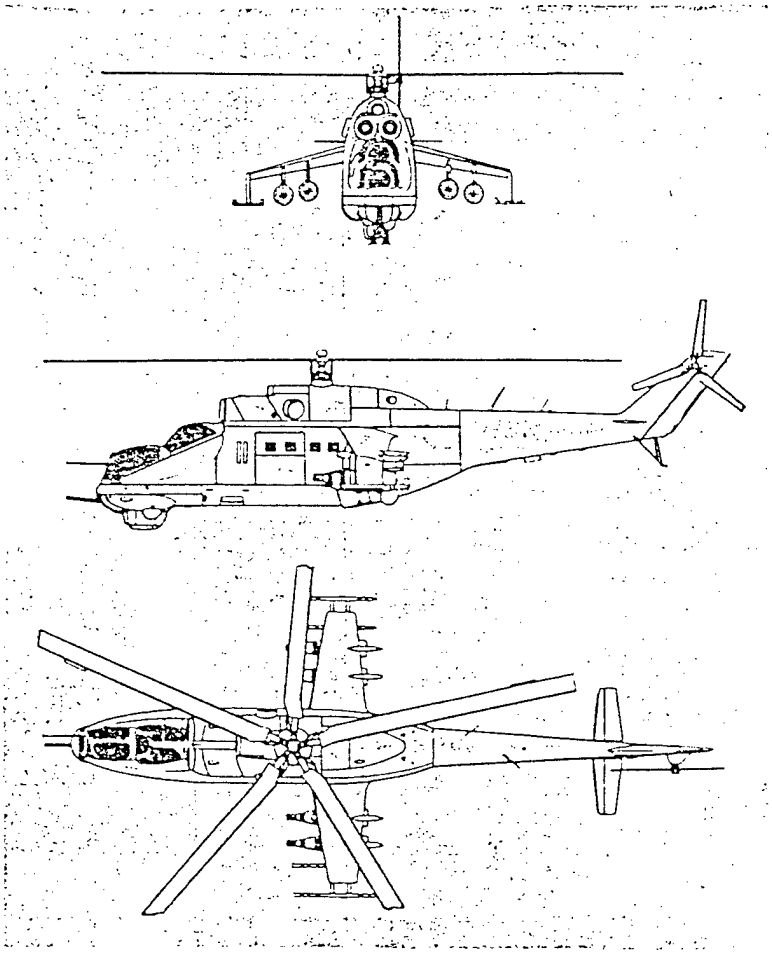

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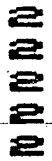

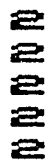

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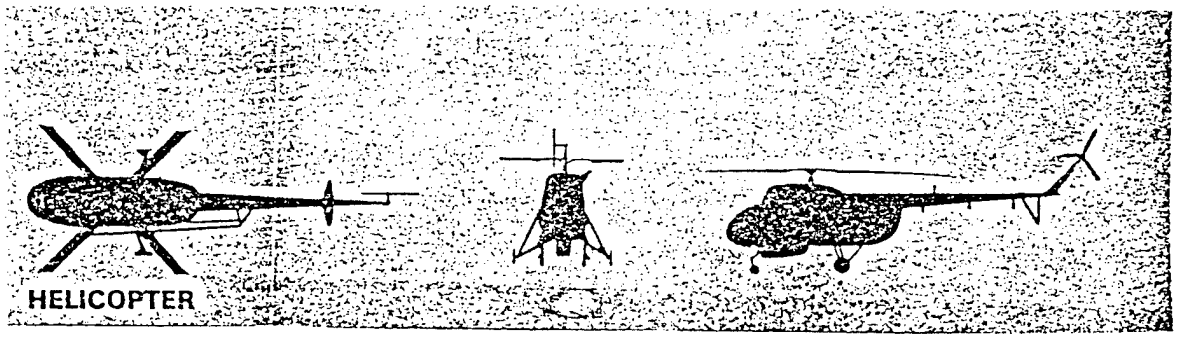

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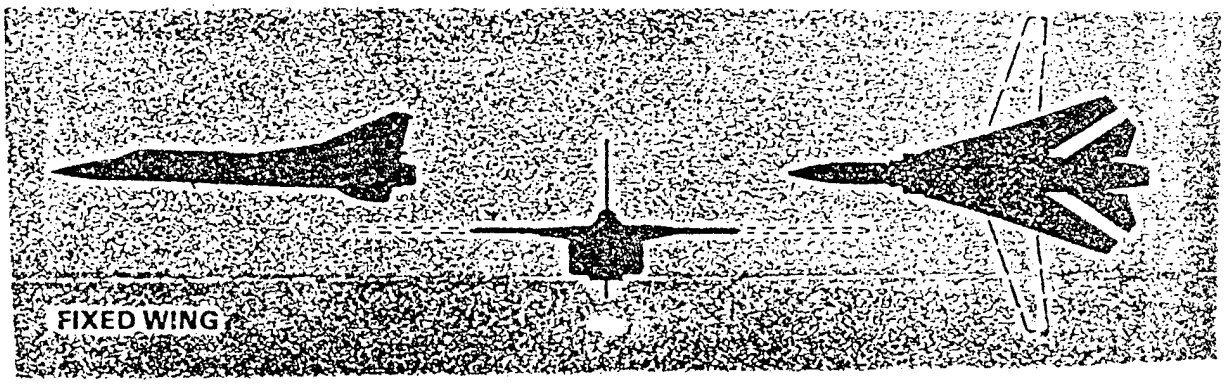

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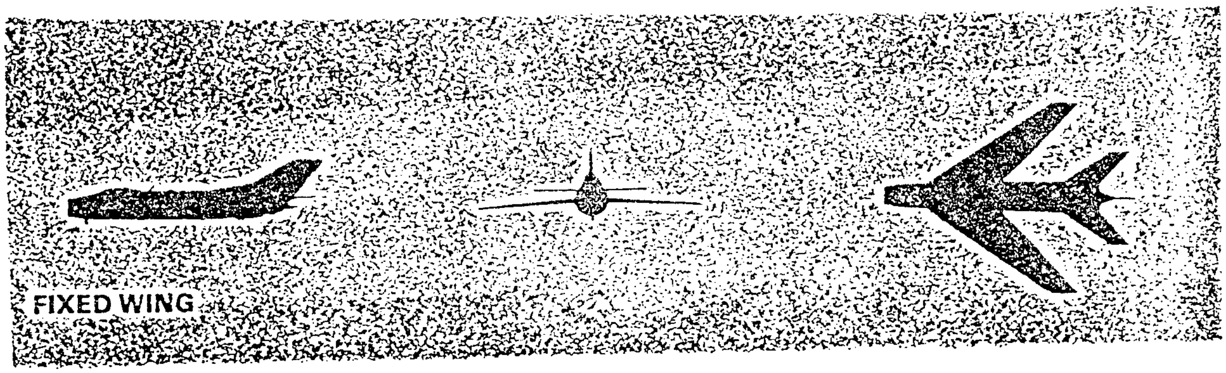

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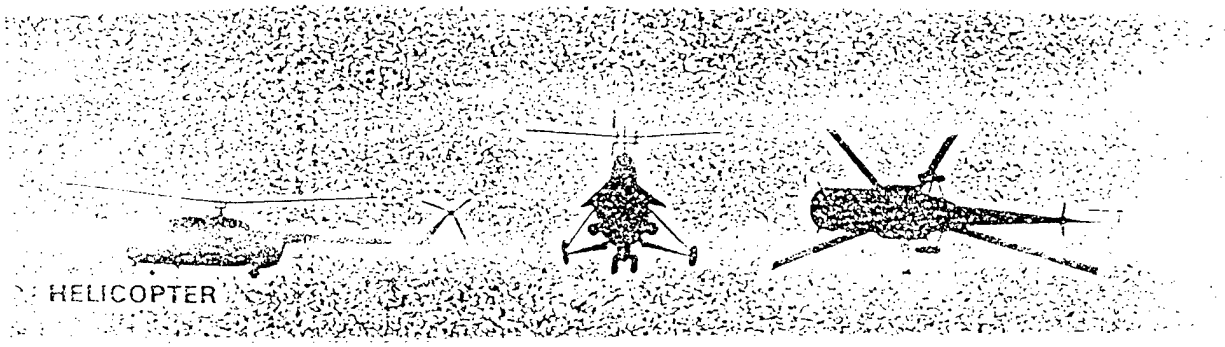

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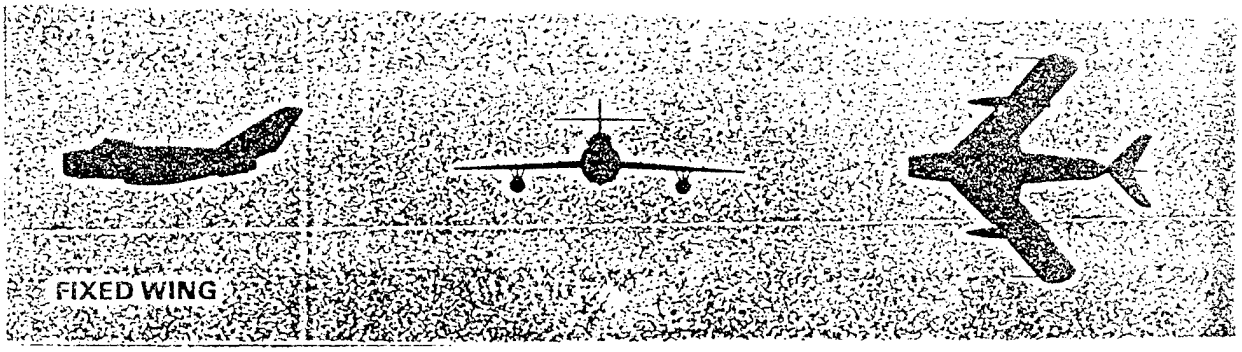

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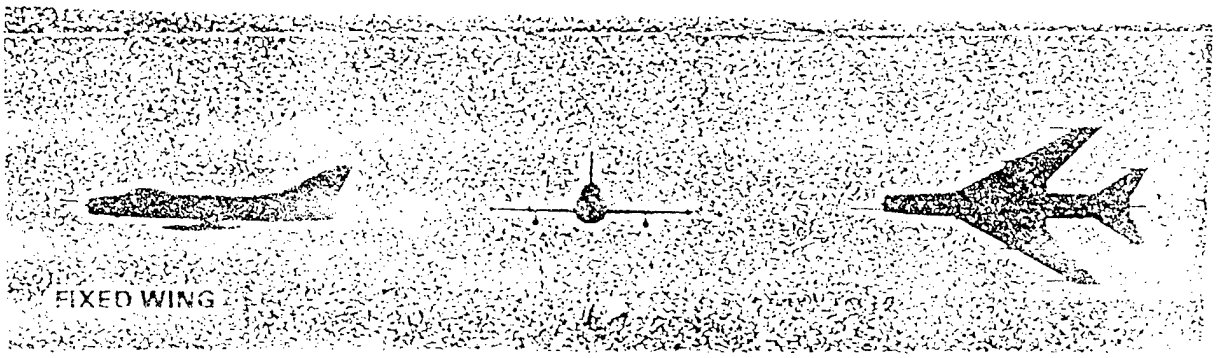

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Appendix D

NT Paper and Pencil Knowledge Test

NAME: _____

COMPANY: _____

DATE: _____

Record the numerical designation or standard NATO reporting name for each aircraft.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Appendix D

NT Paper and Pencil Knowledge Test

DO NOT OPEN THIS TEST UNTIL YOU ARE TOLD TO DO SO

This test contains questions on many of the subjects you have studied over the last six or seven weeks of your training. There are 75 questions. Read each question carefully and choose the best answer.

MARK YOUR ANSWERS ON THE ANSWER SHEET PROVIDED. USE A NUMBER 2 PENCIL ONLY.

DO NOT WRITE ON THE TEST.

When you finish, raise your hand and the test administrator will come and collect your test.

DO NOT BEGIN UNTIL TOLD TO DO SO.

1. A class III leak will be reported to organizational maintenance on DA Form _____
   a. 2404-1
   b. 2408-4
   c. 2404
   d. 1970

2. When checking stabilization for drift in EMERGENCY mode and drift is present, what are your actions?
   a. use AZ and EL knobs to null out drift
   b. notify organizational maintenance
   c. perform computer self-test
   d. take cadilac controls off and adjust drift with a screwdriver

3. What hydraulic pressure is required for normal operation of the turret?
   a. 1500-1700 lbs
   b. 870-950 lbs
   c. 1250-1350 lbs
   d. 1150-1500 lbs

4. If you correct a fault, you will
   a. disgard the 2404
   b. write in corrective action and initial on items corrected
   c. leave the space on the form blank

5. When performing duties as a driver of an M1 tank and the fire command "MISSILE" is given by the TC, you would
   a. turn on GAS particulate
   b. start evasive action by making radical turns and alternating speed
   c. alert the crew
   d. wait for instructions from TC

6. The precleaner is attached to the hull by
   a. 4 clamps
   b. 4 clamps and a butterfly latch
   c. 4 butterfly latches and a hose clamp
   d. 4 butterfly latches

7. The aiming point for a battlesight engagement is
   a. base of visible mass
   b. center of mass
   c. imagined base of mass
   d. center of visible mass

8. What are two techniques of direct fire?
   a. precision, battlesight
   b. precision, degraded mode
   c. degraded mode, battlecarry
   d. multiple engagements, simultaneous engagements

9. The loader's hatch should not be operated when
   a. turret is moving
   b. hull is moving
   c. tank is moving
   d. none of the above

10. When preparing loader's station for operation the spent case ejection guard is in the _____ position.
   a. up
   b. down
   c. forward
   d. rear

11. When the position of the unservicable track block is correct for removal it would be
   a. between the drive sprocket and #7 roadwheel
   b. midway between the compensating idler wheel and support roller
   c. midway between the compensating idler wheel and #1 roadwheel

12. The correct nomenclature for the VRC mount is
   a. CX-4722
   b. AM-2060
   c. MT-1029
   d. CG-1773

13. What is the tacticle idle speed for the M1 tank?
   a. 870-950
   b. 1500-1700
   c. 1250-1350
   d. 1100-1500

14. The 2 second delay between throttling the engine up and the tank moving out can be avoided by doing what?
   a. setting the transmission to low
   b. turning the bilge pump on
   c. turning on the tacticle idle switch
   d. holding the starter only switch for 20 seconds

15. After the track support assembly is installed you should
   a. remove center guide
   b. remove end connectors
   c. release track tension

16. After the new track block is installed you should
   a. adjust track tension
   b. install center guides
   c. install end connectors

17. What size socket is used to remove center guides?
   a. 25 mm
   b. 30 mm
   c. 50 mm
   d. 15 mm

18. When firing the M240 machine gun and a stoppage occurs, you must determine if it is a hot gun or a cold gun. What constitutes a hot gun?
    a. 150 rounds in 2 minutes
    b. 200 rounds in 2 minutes
    c. 200 rounds in 15 minutes
    d. 200 rounds in less than 2 minutes

19. Adjusting breech operating cam will
    a. make breech operate easy
    b. regulate ejection speed of cartridge case
    c. helps to open breech manually

20. What is the purpose of the breeckblock crankstop?
    a. to hold the breechblock in the open position
    b. to make contact for the firing circuits
    c. to keep the breeckblock from traveling beyond the bottom limit
    d. to keep the breechblock from traveling beyond the upper limit

21. To secure the precleaner the position of the turret should be
    a. over the back deck
    b. over the front slope
    c. over the left side

22. When cleaning the precleaner you should use
    a. MO GAS
    b. water
    c. CLP

23. The breechblock's spring tension adjuster has how many adjuster notches?
    a. 1 notch
    b. 2 notches
    c. 3 notches
    d. 4 notches

24. How many gas ports are located on the main gun inside the bore evacuator?
    a. 2
    b. 4
    c. 1
    d. 3

25. What is/are the minimum number of rounds used to calibrate an M1 tank?
    a. 1
    b. 2
    c. 3
    d. 4

26. When performing GPS adjustments reticle drift will not be more than half a mil in _____ seconds.
    a. 5
    b. 10
    c. 15
    d. 20

27. When performing computer data check and barametric pressure is not available use
    a. 29.92
    b. 92.29
    c. 29.29
    d. 92.92

28. When firing main gun and palm switches are released _____ will not work.
    a. control handles
    b. laser buttons
    c. triggers
    d. all of the above

29. The coaxial machine gun should be fired in _____ to _____ round bursts.
    a. 10 to 20
    b. 15 to 20
    c. 20 to 25
    d. 30 to 40

30. Which socket head key(s) (allen wrench) is required to service the bore evacuator?
    a. 3/16"
    b. 3/16" and 5/32"
    c. 5/32" and 1/8"
    d. 1/8" and 3/16"

31. When setting headspace and timing on the M2TT, what is the sequence of the guages?
    a. GO, NO GO, NO FIRE, FIRE
    b. FIRE, NO FIRE, NO GO, GO
    c. NO GO, GO, FIRE, NO FIRE
    d. NO FIRE, FIRE, GO, NO GO

32. What are the 3 tactical positions of the tank?
    a. HIDE, TURRET DOWN, HULL DOWN
    b. HULL DOWN, CAMOFLAUGED, COVER
    c. HIDE, COVER, CONCEALMENT

33. How many tanks does it take to tow a disabled tank with final drives disconnected?
    a. 1 M1 tank
    b. 1 M88 recovery vehicle
    c. 2 M1 tanks, 1 in front and 1 in back
    d. 3 M1 tanks, 2 in front and 1 behind

34. How many vehicles are required to upright an overturned tank?
    a. 1
    b. 2
    c. 3
    d. 4

35. What kind of brush do you use to clean the fire sensor lens?
    a. soft paint brush
    b. sash brush
    c. camel hair brush
    d. both a and c

36. To prepare the M250 grenade launcher for travel:
    a. load the grenade launcher
    b. do a circuit test then load
    c. unload and place covers on

37. What must you do when the third adjustment notch is being used on the spring adjustment of breech tension?
    a. check operation of breech
    b. notify organizational maintenance
    c. note on the 2408-4

38. On a short halt in a road march of M1s, what type of maintenance should the operators conduct?
    a. after checks
    b. before checks
    c. concurrent checks
    d. during checks

39. What is the preferred method of payment to soldiers after initial entry training?
    a. check--to your unit
    b. check--to you at an address you designate
    c. cash--to you at your unit
    d. sure pay/direct deposit

40. The loader checked the hydraulic system oil reservoir; oil level on the reservoir oil level guage was low. What type of oil does the oil reservoir take?
    a. Mi L-L-23699
    b. CLP
    c. OEA
    d. FRH

41. The driver checked the compensating idler wheel, and the oil was more than 1/2 inch low. What type of oil does the compensating idler wheel take?
    a. OE/HDO-30
    b. 10-W-40
    c. OE-5
    d. TSO

42. When adjusting track tension, which of the following is true?
    a. It is not necessary to add tension unless the compensating idler wheel moves forward a full inch.
    b. The engine should be running at approximately 870-950 RMPs.
    c. The parking brake should be released.
    d. The rotary shocks should have already been greased.

43. The coax machine gun ready box can hold _____ rounds.
    a. 1500
    b. 3000
    c. 4800
    d. 5000

44. When loading the main gun ready ammo compartment, you will
    a. pull and turn locking shaft 1/4 turn clockwise.
    b. ensure turret hydraulic pressure gauge shows zero.
    c. remove quick release pin from slide rack.

45. The first step in loading the M250 grenade launcher is
    a. remove cover
    b. get grenades
    c. tell TC to set turret power switch to off
    d. check for dirt or sharp objects in discharger tubes

46. When loading the main gun, the loader's seat back is
    a. placed up
    b. taken off
    c. placed down
    d. installed

47. The main gun status lights are controlled by
    a. gun/turret drive switch
    b. main gun safe switch
    c. ejection guard
    d. loader's power switch

48. When loading the main gun semi ready ammo compartment, you will ensure
    a. turret power is on
    b. TC backguard is removed
    c. the loader's knee switch is in down position

49. After loading the hull ammo, you will ensure
    a. the hull ammo doors are open
    b. the locking pin and quick release pin are installed
    c. the locking pin is removed

50. How many rounds are stowed for 105 mm?
    a. 21 ready, 22 semi ready, 8 hull
    b. 22 ready, 22 semi ready, 6 hull, 3 turret rack
    c. 21 ready, 21 semi ready, 8 hull, 4 turret rack
    d. 22 ready, 22 semi ready, 8 hull, 3 turret rack

51. Main gun maximum recoil is how far?
    a. 10 inches
    b. 24 inches
    c. 13 inches
    d. 16 inches

52. After loading main gun and before announcing "up", you must
    a. move ejection guard to rear
    b. check red armed light
    c. move ejection guard forward
    d. both b and c

53. You are checking headspace on the M2HB machine gun. What are your actions if the NO GO guage fits in the T-slot?
    a. Unscrew barrel 1 click and try again.
    b. Screw barrel in 1 click and try again.
    c. Remove back plate and turn adjusting screw all the way down.
    d. Insert Go end of gauge into T-slot.

54. When entering the gunner's station, you will ensure
    a. the gun/turret drive switch is in the powered position
    b. spent case ejection guard is in the safe position
    c. the ready ammo door is open

55. The fire control system is designed to function normally at _____ to _____ volts.
    a. 18 to 30
    b. 12 to 16
    c. 6 to 12

56. The gunner's hydraulic pressure guage should read
    a. 1700 to 2000 PSI
    b. 1100 to 1500 PSI
    c. steady, 1500 to 1700 PSI
    d. 2000 PSI or more

57. When powering down gunner's station, the _____ switch is set to safe before turret power is turned off.
    a. gun select
    b. thermal test
    c. thermal mode
    d. laser range finder

58. When performing a fire circuits test, the main gun should be
    a. loaded
    b. in the safe position
    c. armed

59. Which switch must be set to standby for 5-15 minutes to cool down the TRV prior to operating the TIS?
    a. CCP power switch
    b. thermal test pattern switch
    c. thermal mode switch
    d. polarity switch

60. When in MOPP level 4, what would you use to decontaminate your gloves with when using the latrine?
    a. M11 decontamination apparatus
    b. mark V injectors
    c. M58A1 skin decontamination kit
    d. M9 paper

61. _____ mode is a backup for normal mode.
    a. Manual
    b. Power
    c. Emergency
    d. Hydraulic

62. _____ mode disables the power control handles.
    a. Manual
    b. Power
    c. Emergency
    d. Hydraulic

63. The automatic lead system works only in the _____ mode.
    a. Manual
    b. Normal
    c. Emergency
    d. Power

64. After setting the engine shut off switch down, the engine will coast to a stop in _____ to _____ seconds.
    a. 10 to 20
    b. 60 to 70
    c. 30 to 60
    d. 45 to 50

65. When driving an M1 tank at night, which night vision device is used?
    a. PVS-5
    b. AN/VVS-2
    c. infrared lens
    d. driver's periscopes

66. When powering down and securing gunner's station, all of the following switches are positioned correctly except
    a. gun select on trigger safe
    b. thermal mode switch on off
    c. MRS switch to out
    d. LRF switch on first return

67. The GPS reticle is
    a. fixed ballistic reticle
    b. painted nonballistic reticle
    c. standard nonballistic reticle like the M60 series
    d. projected nonballistic reticle

68. The M1's transmission has how many forward gears?
    a. 2
    b. 3
    c. 5
    d. 4

69. _____ switch must be set to ON for fire extinguisher system to operate automatically.
    a. First shot
    b. Turret power
    c. Vehicle master power
    d. First and second shot

70. When installing track move tank so that the #7 road wheel is over the _____ track shoe from the rear.
    a. 7th
    b. 2nd
    c. 13th
    d. 9th

71. How many track shoes are normally on the tank?
    a. 205 blocks
    b. 110 blocks
    c. 156 blocks
    d. 172 blocks

72. When performing mouth to mouth, how many breaths do you give per minute?
    a. 12
    b. 5
    c. 10
    d. 6

73. The gunner's primary sight has a magnification power of _____ and _____.
    a. 5x and 10x
    b. 3x and 15x
    c. 2x and 8x
    d. 3x and 10x

74. The multiple return symbol will appear when the laser range finder receives more than _____ return(s).
    a. 2
    b. 4
    c. 1
    d. 3

75. Where is the cable located that plugs into the AN/VVS-2?
    a. behind the steering control connected to a dummy plug
    b. by the right knee connected to a dummy plug
    c. by the left knee connected to a dummy plug
    d. behind the driver's seat by the hull networks box connected to a dummy plug

Appendix E

TCGST Simulation:
Station 5 - Remove, Disassemble, and Install the M68 Breechblock

Subject: Breechblock Modified Test Directions
To: ARI Research Team
From: Bob Du Bois
Date: 15 May 1986

BREECHBLOCK TEST DIRECTIONS (MODIFIED)

Good (morning/afernoon) men:

I am with the United States Army Research Institute located here at Ft. Knox, Kentucky. This (morning/afternoon) you have been selected to participate in a research project that involves the development and use of a simulated performance test to measure job task performance. Specifically, what we are interested in finding out from this research is how well you can perform on an audio-visual (slide) test about the Main Gun Breechblock. The Audio-Visual Slide Test you will be given here today involves the Main Gun Breechblock tasks of removal, disassembly, assembly and installation. The test will take approximately 30 minutes to complete, but before we start I want you to print your name at the top right hand corner of the answer sheet in the space provided. (Pause)

During the next five minutes you will be instructed on how to take the Audio-Visual Slide test on the Main Gun Breechblock. After these instructions are finished, you will be given the opportunity to ask any questions you might have about the test before we begin testing. Now listen up and pay close attention to what you are being asked to do.

INSTRUCTIONS

In the breechblock test you are about to take, you will be shown a slide and than asked a question. The number of the question will always be presented prior to each question. The questions you will be asked will be of three types:

What part would you take action on?

What action would you take?, or

What picture shows the result of that action?

Possible answers to the question are the letters A, B, or C shown on the slides. After selecting your answer you are to do two things. First, find the number on the answer sheet that corresponds to the number of the question being asked. Second, mark an "X" over the letter on the answer sheet that corresponds to your answer. To demonstrate how the breechblock test is set up, we have put together a series of practice questions on the M219 machine gun. We understand that you are not trained to use the M219 machine gun, buy these slides and questions are only meant to give you an understanding of the kind of questions that are on this test.

For example, Practice Question Number 1. Which part would you take action on first to disassemble the M219 machine gun? "A" shows the barrel and jacket assembly, "B" shows the cover, and "C" shows the charger assemble. To complete this question you would choose A, B, or C, find the number 1 under "Practice Questions" on the answer

sheet, and circle your answer. For this question you would have put an X over the letter "A" opposite the number 1 under practice questions.

Practice Question Number 2. Which action would you take to remove the barrel and jacket assembly? A, B, or C shows three possible ways to remove the barrel and jacket assembly. To complete this question you would choose A, B, or C, find the number of the practice question on the answer sheet and then X your answer. For this question the letter C was correct.

Practice Question Number 3. After removing the barrel and jacket assembly which part would you take action on next? If you had put an X on letter "B", the cover, your answer would be correct.

Practice Question Number 4. Which part would you take action on to remover the cover? The correct answer here is "C".

Practice Question Number 5. Which action would you take on the cover latch rod to remove the cover? The correct answer here is "C".

The Audio-Visual Slide test you will be given here today was developed using the M68 (105mm) Main Gun Breechblock found on the A3 tank. The breechblock assembly mechanism is essentially the same for both the M1 and A3 tanks. However, some of the questions in this test refer to specific parts of the A3 breechblock which you are probably not familiar with. Although we will show you

these questions, these questions will not be reflected in your test score. In fact, the answers to these questions are marked on your answer sheet.

In the breechblock test you are about to take, some questions will ask you to choose two parts or two actions. To record your answer you should simply put an X over the two letters that correspond to your answers. For example, Practice Question Number 6. What two actions would you take to remove the right guide rod and spring? To do this you would push in on the guide rod to compress the spring (the letter "C") and then rotate the guide rocd counterclockwise (the letter "A") to remove it. Both the letter "A" and the letter "C" should be marked on the answer sheet.

During the test you will have approximately 10 seconds to record your answer before the next slide and question is (Present question & slide simultaneously... pause).
presented. If at any time during the test you don't know the answer to a particular question or do not have enough time to respond, try to guess the correct answer. Your score will not be penalized for guessing.

One important note about this exam: Nine of the items on this test are specific to the A3 tank. These questions will not be reflected in your test score. In fact, the answers to these question are marked on your answer sheet.

If you have any questions now about how to take this test, please raise your hand and we will help you.

(Pause)

We will now begin the test. Remember to answer the questions as quickly as you can so that you will not miss the next question.

MAIN GUN BREECHBLOCK TEST

Answer Sheet

NAME KEY UNIT _____

Practice Questions (Circle answer)

1. (A) B C D
2. A B (C) D
3. A (B) C D
4. A B (C) D
5. A B (C) D
6. (A) B (C) D

FOR ADMINISTRATIVE USE

ST Score	RE	DI	AS	IN	HO Score	RE	DI	AS	IN
PF	___	___	___	___	PF	___	___	___	___
ER	___	___	___	___	ER	___	___	___	___

TEST QUESTIONS

Remove	Disassemble	Assemble	Install
1. (A) B C D	17. A B (C) D	20. (A) B C D	28. A (B) C D
2. A (B) C D	18. (A) (B) C D	21. A (B) C D	29. A (B) C D
3. A B (C) D	19. A (B) C D	22. A (B) C D	30. A (B) C D
4. (A) B C D		23. A B (C) D	31. (A) B C D
5. A (B) C D		24. A (B) C D	32. A (B) (C) D
6. A B (C) D		25. A (B) C D	33. (A) B C D
7. A B (C) D		26. A (B) C D	34. (A) (B) C D
8. (A) B C D		27. (A) B C D	35. A (B) (C) D
9. A (B) C D			36. A B (C) D
10. A B (C) D			37. (A) B C D
11. A B (C) D			38. (A) B C D
12. A (B) C D			39. (A) B C D
13. (A) B C D			40. A (B) C D
14. A (B) C D			41. A (B) C D
15. A (B) C D			42. A (B) C D
16. A B (C) D			43. A (B) C D
			44. A (B) C D

MAIN GUN BREECHBLOCK TEST

Answer Sheet

NAME _____ UNIT _____

Practice Questions (Circle answer)

1. (A) B C D
2. A B (C) D
3. A (B) C D
4. A B (C) D
5. A B (C) D
6. (A) B (C) D

FOR ADMINISTRATIVE USE

ST Score	RE	DI	AS	IN	HO Score	RE	DI	AS	IN
PF					PF				
ER					ER				

TEST QUESTIONS

Remove	Disassemble	Assemble	Install
1. (A) B C D	17. A B C D	20. A B C D	28. A B C D
2. A (B) C D	18. A B C D	21. A B C D	29. A B C D
3. A B (C) D	19. A B C D	22. A B C D	30. A B C D
4. A B C D		23. A B C D	31. A B C D
5. A (B) C D		24. A B C D	32. A B C D
6. A B C D		25. A B C D	33. A B C D
7. A B C D		26. A B C D	34. A B C D
8. A B C D		27. A B C D	35. A B C D
9. A B C D			36. A B C D
10. A B C D			37. A B C D
11. A B (C) D			38. A B C D
12. A B C D			39. A B C D
13. A B C D			40. A (B) C D
14. A B C D			41. A B C D
15. A B C D			42. A B C D
16. A B (C) D			43. A (B) C D
			44. A (B) C D

Paper and Pencil Copy

MAIN GUN BREECHBLOCK TEST QUESTIONS

1. Before you begin to remove and disassemble the breechblock, which part would you check out first?

   (a) Main gun safety lever
   b. Adjuster
   c. Breechblock crankstop

2. Which picture shows the main gun safety in the safe position?

   a. Safety lever's forward (up)
   (b) Safety lever is rearward (down)
   c.

3. Which part would you check out next?

   a. Main gun safety lever
   b. Adjuster
   (c) Breechblock crankstop

4. Which picture shows the crankstop in the correct position?

   a. Crankstop is rearward (up)
   b. Crankstop is forward (down)
   c.

5. Which part would you take action on to complete the safety checks?

   a. Safety release lever
   (b) Breech operating handle
   c. Eyebolt screw

6. With the safety checks completed which part would you take action on next?

   a. Breech operating handle
   b. Eyebolt screw receptable
   c. Firing pin assembly

7. After remvoing the firing pin assembly, which part would you take action on next?

   a. Breech operating handle
   b. Firing pin well
   c. Eyebolt screw

8. After hooking the chain to the turret roof and eyebolt screw; which picture shows how tight you would crank the chainhoist?

a. Tight
b. Loose
c. Moderately tight

9. With the chain tight, which part would you take action on next?

a. Breechblock crankstop
b. Adjuster
c. Chain hoist crank

10. Which action would you take first to release spring tension on the adjuster?

a. Push forward
b. Depress plunger
c Pull rearward

11. With the adjuster tension released, which part would you take action on next?

a. Manual elevation handle
b. Chain hoist crank
(c) Breechblock crankstop

12. Which of these pictures shows the result of that action?

a. Crankstop is rearward (up)
b. Crankstop is forward (down)
c.

13. After reversing the direction of the chainhoist, which part would you take action on to start the breech downward?

a. Breechblock operating handle
b. Chain hoist crank
c. Firing pin well

14. Once the breechblock starts downward, how far down would you lower the breechblock?

a. Partially
b. Midway
c. Completely

15. Which action would you then take to remove the pivot pin?

a. Push up
b. Push right
c. Pull down

16. Once the chainhoist is removed from the eyebolt screw, which action would you take next?

a. Unhook chain hoist
b. Lower breech operating handle
c. Remove extractor

17. To disassemble the breechblock mechanism which part of the firing contact group would you take action on to unlock it?

a. Center circle of firing contact
b. Recessed edge of firing contact
c. Plunger

18. Which <u>two</u> actions would you take?

a. Rotate counterclockwise
b. Depress plunger.
c. Rotate clockwise.

19. To disassemble the retractor driver group, which part would you take action on?

a. Retractor driver clamp
b. Screw
c. Retractor driver

20. To assemble the breechblock mechanism which picture shows the order in which you would assemble the retractor driver group?

a. Screw, clamp, driver, shaft, spring
b. Screw, clamp, spring, shaft, driver
c. Screw, shaft, clamp, spring, driver

21. After installing the spring, which action would you take to install the retraction driver shaft?

a. Large end of shaft down
b. Large end of shaft up
c.

22. Which action would you take to install the retractor driver?

a. Align holes with L-shaped sides facing down
b. Align holes with L-shaped sides facing up
c. Place L-shaped sides up

23. Which action would you take to install the retractor driver clamp?

a. Align so hole in clamp is closer to bottom of breechblock
b. Align so hole in clamp is closer to right side of breechblock
c. Align so hole in clamp is closer to top of breechblock

24. Which picture shows the order in which you would assemble the firing contact group?

a. Spring, plunger, retainer, washer, shaft, sleeve
b. Retainer, washer, shaft, sleeve, plunger, spring
c. Retainer, sleeve, shaft, washer, plunger, spring

25. Which action would you take to install the firing contact sleeve?

a. Insert with small tip-end up
b. Insert with small tip-end down
c.

26. Which action would you take to install the firing contact?

a. Insert with small tip-end up
b. Insert with small tip-end down
c.

27. After installing the washer and spring, which action would you take to install the plunger?

a. Insert with small tip-end up
b. Insert with small tip-end down
c.

28. To install the breechblock into the breech rings, which extractor would you install in the right side of the breech?

a. Extractor with plunger at 11 o'clock
b. Extractor with plunger at 1 o'clock
c.

29. Which action would you take?

a. Insert with plunger facing breech ring
b. Insert with plunger facing opposite breech ring
c. Insert with plunger facing down toward breechblock cavity

30. After hooking up the chain hoist, how far up would you raise the breechblock?

a. Just off turret floor
b. Up to tip of extractors
c. Up to top of breech ring

31. With the breechblock in this position, which part would you take action on next?

a. Plunger
b. Tip of extractor
c. Eyebolt screw

32. Which two actions would you take to trip the right extractor plunger?

a. Depress the operating handle plunger
b. Push forward on chain hoist crank
c. Depress plunger with screw driver

33. After both plungers have been depressed, how far up would you raise the breechblock?

a. Two clicks
b. Five clicks
c. Seven clicks

34. Which two actions would you take to guide the breechblock pivot pin into the T-slot?

a. Push forward on chain hoist crank
b. Check position of pivot pin in arm
c. Slide pivot pin to left of arm

35. Which two actions would you take to trip the right extractor?

a. Push rearward on extractor with screwdriver
b. Push rearward on chain hoist crank
c. Push forward on extractor with finger

36. With the breechblock now fully raised, which part would you take action on next?

a. Adjuster
b. Chain hoist
c. Breechblock crankstop

37. After positioning the crankstop, which part would you now take action on?

a. Adjuster
b. Chain hoist
c. Breechblock crankstop

38. Which action would you take to apply spring tension to the adjuster?

a. Pull rearward
b. Push upward
c. Push forward

39. In which recess would you place the adjuster?

a. Plunger is not visible
b. Half of plunger is visible
c. Plunger is fully visible

40. After removing the chainhoist and eyebolt screw, which part would you take action on next?

a. Breech operating handle
(b) Firing pin well
c. Eyebolt screw

41. Which action would you take to install the retractor guide assembly?

a. Insert with flat-end of guide forward and retractor down
b. Insert with open-end of guide forward and retractor up
c. Insert with falt-end of guide forward and retractor up

42. Which action would you take to install the firing pin?

a. Insert with flat-end forward
b. Insert with pointed-end forward
c.

43. With the breechblock fully installed, which part would you take action on next?

a. Safety rear
(b) Breech operating handle
c. Gunner's stab controls

44. If the breech closes, too slowly, during the function check, which part would you take action on?

a. Safety lever
(b) Adjuster
c. Breechblock crankstop

Appendix F

TCGST Simulation:
Station 14 - Issue Initial and Subsequent Fire Commands

ISSUE INITIAL AND SUBSEQUENT FIRE COMMANDS

TOTAL CORRECT _____
(out of 27)

NAME: KEY

COMPANY: _____

DATE: _____

SCENARIO 1

TC: GUNNER
SABOT
MOVING TANK (or RANGE)

Loader: UP

Gunner: IDENTIFIED (or LAZING)

TC: FIRE

Gunner: ON THE WAY

Loader: UP (or TRIGGER SAFE)

TC: TARGET, CEASE FIRE

SCENARIO 2

TC:	GUNNER	—
	HEAT	—
	MOVING TANK (or RANGE)	—
Loader:	UP	—
Gunner:	IDENTIFIED (or LAZING)	RE-ENGAGING

TC: FIRE, FIRE SABOT

Gunner: ON THE WAY

TC: TARGET, CEASE FIRE

Loader: SABOT UP (or TRIGGER SAFE)

SCENARIO 3

TC: GUNNER
BATTLESIGHT
TANK (or RANGE)

Loader: UP

Gunner: IDENTIFIED

TC: FIRE

Gunner: ON THE WAY

Loader: UP (or TRIGGER SAFE)

TC: TARGET, CEASE FIRE

ISSUE INITIAL AND SUBSEQUENT FIRE COMMANDS

NAME: _____

COMPANY: _____

DATE: _____

SCENARIO 1

TC: _____

_____

_____

Loader: _____

Gunner: _____

TC: _____

Gunner: _____

Loader: _____

TC: _____

SCENARIO 2

TC: _____

_____

_____

Loader: _____

Gunner: _____

TC: _____

Gunner: _____

TC: _____

Loader: _____

SCENARIO 3

TC: _____

_____

_____

Loader: _____

Gunner: _____

TC: _____

Gunner: _____

Loader: _____

TC: _____

ISSUE INITIAL AND SUBSEQUENT FIRE COMMANDS

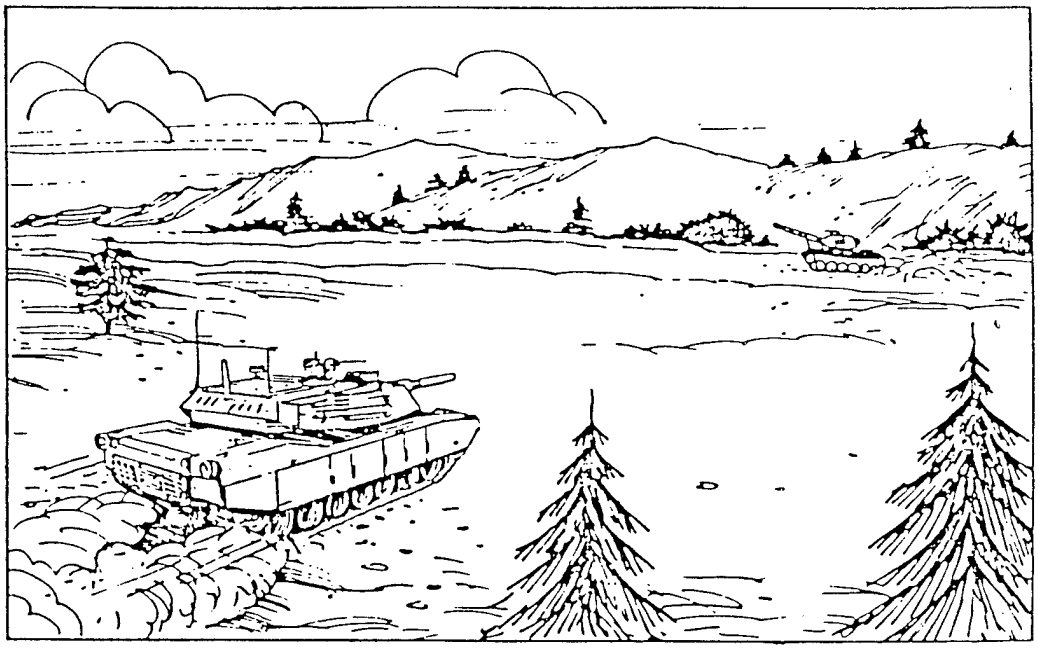
The purpose of this test is to evaluate your ability to issue initial and subsequent fire commands. You will be shown a battlefield scenario with a written description of the situation and the fire command you are to issue. The scenario description will be read aloud. You will have ~~60~~ 90 seconds after the signal "BEGIN" to write your fire command AND the crew responses on the answer sheet. Do NOT write anything on the test booklet.

Do NOT turn to the scenario until you are told to do so.

Do you have any questions about the administration of this test?

Do NOT write on this test!

SCENARIO 1

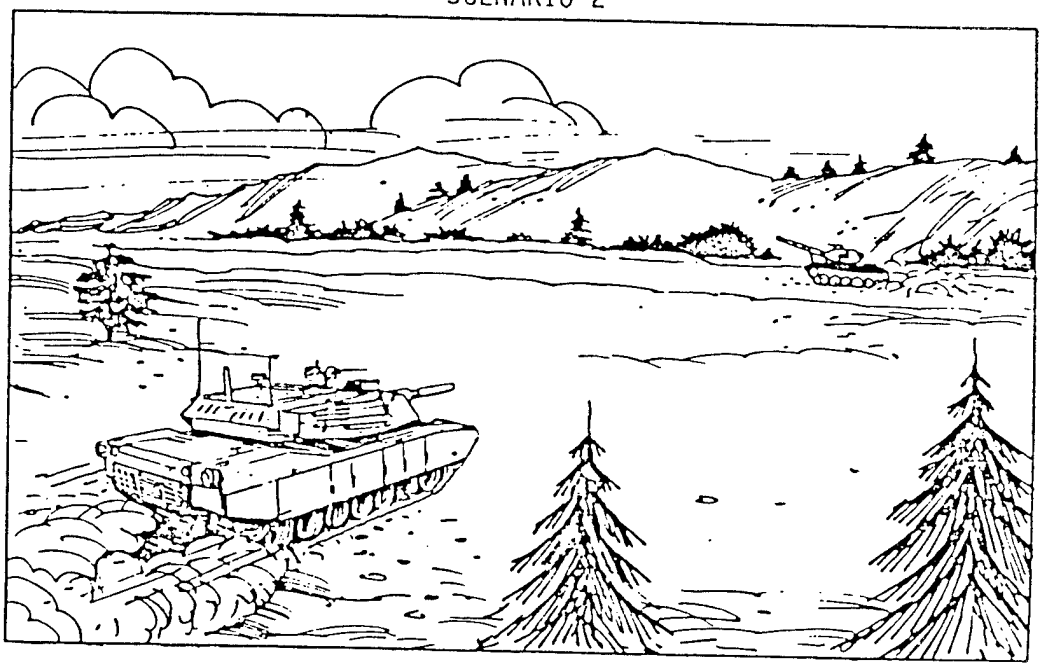


SITUATION 1.

- You are in a hasty attack.
- You meet a T-72 moving off to your right, about 1880 meters away.
- The T-72 sees you.
- Round loaded is SABOT.
- M1 is fully operational.

ISSUE AN INITIAL FIRE COMMAND FOR A PRECISION ENGAGEMENT FOR THIS TARGET.

SCENARIO 2

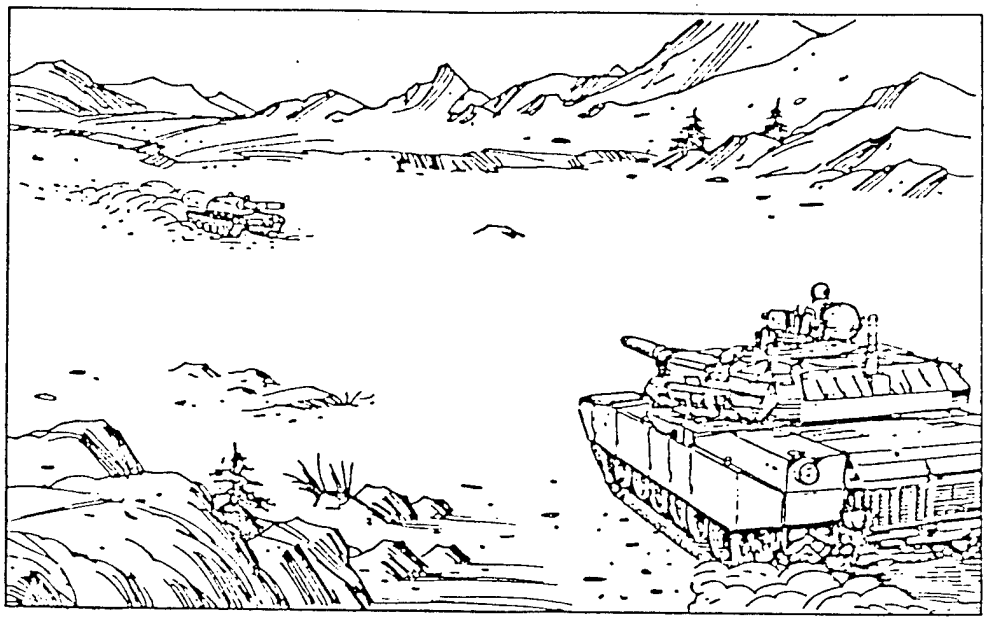


SITUATION 2.

- You are in a hasty attack.
- You meet a T-72 moving in from you right, range 1500 meters.
- The T-72 sees you.
- Round loaded is HEAT.
- M1 is fully operational.
- You've just fired a SABOT round which was lost (unobserved).

ISSUE A SUBSEQUENT FIRE COMAND FOR A PRECISION ENGAGEMENT. THE STRIKE AT THE FIRST TARGET WAS LOST.

SCENARIO 3



SITUATION 3.

- You are in a hasty attack.
- Round loaded is SABOT.
- You see a T-62 at 1200 meters.
- LRF has failed; "F" is in GPSE.
- Range in GPSE remains unchanged; 2810.

ISSUE AN INITIAL BATTLESIGHT FIRE COMMAND FOR THIS TARGET.

Appendix G

TCGST Simulation:
Station 16 - Estimate and Determine Range to a Target

NAME KEY COMPANY _____

Date _____

RANGE DETERMINATION

Part I: RECOGNITION METHOD

Provide the range estimations for the following targets as seen with the UNAIDED EYE.

TARGET (AS SEEN WITH THE UNAIDED EYE)	RANGE ESTIMATION
1. Troops	500
2. Wheel Vehicle	2,000
3. Truck by Model	1,000
4. Tank	1,500

NOT SCORED

Provide the range estimations for the following targets as seen with magnification of 7 or 8 power.

TARGET (MAGNIFICATION OF 7 OR 8)	RANGE ESTIMATION
1. Armored Vehicle	6,000
2. Truck by Model	4,000
3. Machine gun	2,000
4. Howitzer	5,000

NOT SCORED

PART II.

1. A X C D
2. A B X D
3. X B C D
4. A B X D
5. A B C X

NAME_____ COMPANY_____

Date_____

RANGE DETERMINATION

Part I: RECOGNITION METHOD

Provide the range estimations for the following targets as seen with the UNAIDED EYE.

TARGET (AS SEEN WITH THE UNAIDED EYE)	RANGE ESTIMATION
1. Troops	_____
2. Wheel Vehicle	_____
3. Truck by Model	_____
4. Tank	_____

Provide the range estimations for the following targets as seen with magnification of 7 or 8 power.

TARGET (MAGNIFICATION OF 7 OR 8)	RANGE ESTIMATION
1. Armored Vehicle	_____
2. Truck by Model	_____
3. Machine gun	_____
4. Howitzer	_____

PART II.

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

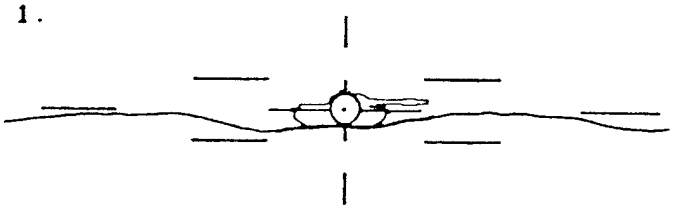
PART II: RANGE DETERMINATION

Do NOT write on this sheet.

Mark your answers on the answer sheet.

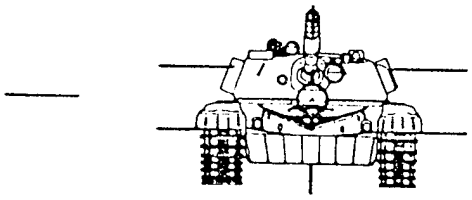
What is the range to each of the following targets?

1.



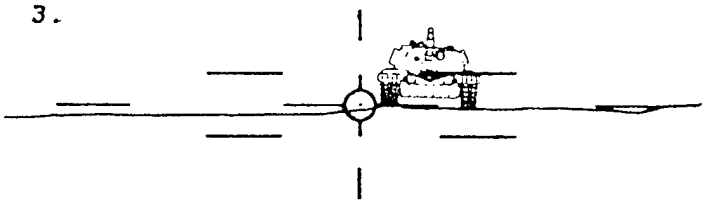
A. 4600m
B. 2150m
C. 1150m
D. 2715m

2.



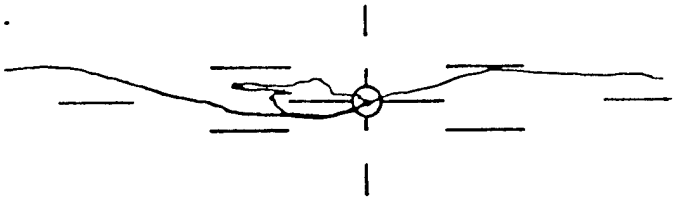
A. 1150m
B. 400m
C. 633m
D. 1533m

3.



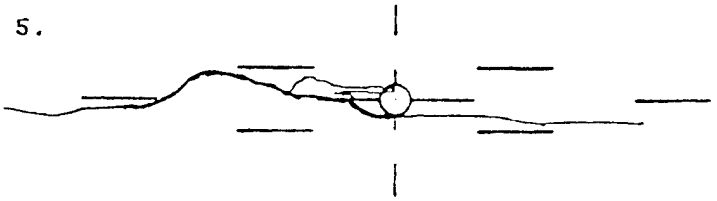
A. 1150m
B. 1675m
C. 575m
D. 2267m

4.



A. 1200m
B. 3000m
C. 2150m
D. 1533m

5.



A. 1000m
B. 667m
C. 3000m
D. 2000m

Appendix H

TCGST Modified Score Sheets and Rating Scale Definitions

CRITERION SCORING CHECKLIST FOR THE TANK CREW GUNNERY SKILLS TEST

IDENTIFY FRIENDLY AND THREAT ARMORED VEHICLES

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

1. _____	11. _____
2. _____	12. _____
3. _____	13. _____
4. _____	14. _____
5. _____	15. _____
6. _____	16. _____
7. _____	17. _____
8. _____	18. _____
9. _____	19. _____
10. _____	20. _____

	GO	NO-GO	INITIALS
Student correctly identified 18 of 20 vehicles by nomenclature.	___/___	_____	_____

EXACT NUMBER CORRECT: _____/20

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 2

CRITERION SCORING CHECKLIST FOR THE TANK CREW GUNNERY SKILLS TEST

IDENTIFY AND EXPLAIN THE USE OF 105-MM MAIN GUN AMMUNITION

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

TYPE AMMUNITION	USED FOR	GO	NO-GO
1.		____	____
2.		____	____
3.		____	____
4.		____	____
5.		____	____
6. Identified and explained the use of all five main gun rounds within time alloted.		____	____

	GO	NO-GO	INITIALS
Student satisfactorily completed all requirements.	____	____	____

NUMBER CORRECTLY IDENTIFIED: _____/5

NUMBER CORRECTLY EXPLAINED: _____/5

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 3

CRITERION SCORING CHECKLIST FOR THE TANK CREW GUNNERY SKILLS TEST

CLEAR, DISASSEMBLE, ASSEMBLE, PERFORM A FUNCTION CHECK, AND LOAD THE 7.62-MM M240 COAX MACHINE GUN

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Cleared the M240 machine gun in sequence.	____	____
a. Ensured safety was in the F (fire) position.	____	____
b. Charged the machine gun.	____	____
c. Placed safety in the S (safe) position.	____	____
d. Opened cover.	____	____
e. Removed the source of ammunition.	____	____
f. Raised the feed tray.	____	____
g. Looked or felt into the chamber.	____	____
h. Lowered feed tray.	____	____
i. Placed safety to the F (fire) position.	____	____
j. Eased the recoiling parts forward.	____	____
k. Closed the cover.	____	____
2. Disassembled and assembled the M240 machine gun.	____	____
3. Performed a function check in sequence.	____	____
a. Ensured safety was in the F (fire) position.	____	____
b. Charged the weapon.	____	____
c. Placed safety in the S (safe) position.	____	____
d. Attempted to fire the weapon. (The weapon should not have fired.)	____	____
e. Placed the safety in the F (fire) position and eased the recoiling parts forward.	____	____
4. Loaded the machine gun.	____	____
a. Ensured safety was in the F (fire) position.	____	____
b. Charged the machine gun.	____	____
c. Placed safety to the S (safe) position.	____	____
d. Opened the cover.	____	____
e. Removed source of ammunition, if present.	____	____
f. Raised the feed tray.	____	____
g. Looked or felt into the chamber.	____	____
h. Lowered the feed tray.	____	____
i. Placed safety to the F (fire) position.	____	____
j. Eased the recoiling parts forward.	____	____
k. Placed link belt in feed tray over belt holding pawls, open link down.	____	____
l. Closed the cover.	____	____
5. Completed all performance measures within 6 minutes.	____	____

	GO	NO-GO	INITIALS
Student completed all steps satisfactorily.	____	____	____

EXACT TIME: _____ / 6 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 4

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

CLEAR, DISASSEMBLE, ASSEMBLE, SET HEADSPACE AND TIMING, PERFORM A FUNCTION CHECK, AND LOAD THE CALIBER .50 M2 HB MACHINE GUN WITH M10 CHARGER

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Cleared the caliber .50 machine gun in sequence.	____	____
a. Set safety switch to S (safe) position.	____	____
b. Opened cover.	____	____
c. Lifted extractor and removed ammunition belt from feedway.	____	____
d. Lowered extractor and closed cover.	____	____
e. Moved the lock selector on M10 charger to the rear (lock) position.	____	____
f. Pulled back on the charger cable handle and locked the bolt to the rear.	____	____
g. Opened the cover.	____	____
h. Looked into both the chamber and T-slot for ammunition.	____	____
i. Moved lock selector on the M10 charger to the forward (release) position.	____	____
j. Pulled back on the charger handle, allowing the bolt to go forward.	____	____
k. Closed cover.	____	____
l. Placed safety to F (fire) position.	____	____
m. Pushed trigger to fire the weapon.	____	____
Note. Did not close cover with bolt locked to the rear.		
2. Disassembled and assembled the caliber .50 machine gun.	____	____
3. Adjusted headspace in sequence.	____	____
a. Opened cover.	____	____
*b. Retracted the bolt until locking lug on barrel locking spring was centered in the hole of right side plate of receiver.	____	____
*c. Held bolt in the above position and unscrewed the barrel two clicks.	____	____
*d. Allowed the recoiling parts to go forward.	____	____

*Disregarded steps 3b, c, and d if the barrel had been backed off two clicks during assembly.

		GO	NO-GO
e.	Cocked the machine gun.	____	____
f.	Allowed the bolt to go forward.	____	____
g.	Retracted the recoiling parts approximately 1/16 inch.	____	____
h.	Raised extractor.	____	____
i.	Inserted GO end of gage into the T-slot between the face of the bolt and barrel.	____	____
j.	If GO end did not enter T-slot:		
	(1) Retracted bolt.	____	____
	(2) Unscrewed the barrel one notch (click).	____	____
	(3) Allowed recoiling parts to go forward.	____	____
	(4) Checked headspace IAW 3g thru i.	____	____
k.	If GO end entered the T-slot, attempted to place NO-GO end of gage into T-slot.	____	____
l.	If NO-GO end did not enter T-slot, went to para 4.	____	____
m.	If NO-GO end entered T-slot:		
	(1) Retracted bolt.	____	____
	(2) Screwed barrel into the extension one notch (click).	____	____
	(3) Allowed recoiling parts to go forward.	____	____
	(4) Checked headspace IAW 3h, and i.	____	____
4.	Set timing in sequence (cock weapon if necessary).		
a.	Raised extractor.	____	____
b.	Pulled charger cable to retract recoiling parts about 1/4 inch.	____	____
c.	Inserted NO-FIRE gage between the barrel extension and trunnion lock.	____	____
d.	NO-FIRE gage beveled edge rested against the barrel notches.	____	____
e.	Slowly released recoiling parts allowing them to go forward.	____	____
f.	Depressed the trigger.	____	____
g.	If the firing pin did not release, went to step 4i.	____	____
h.	If firing pin released:		
	(1) Removed NO-FIRE gage.	____	____
	(2) Retracted the bolt and recocked the machine gun.	____	____
	(3) Removed the backplate.	____	____
	(4) Screwed the timing adjustment nut to the left until it rested on the trigger bar.	____	____
	(5) Inserted FIRE gage.	____	____
	(6) Pressed up on trigger bar and attempted to fire.	____	____
	(7) Rotated the timing adjustment nut to the right one notch and attempt to fire.	____	____
	(8) Continued step 7 and attempted to fire after each click until weapon fired.	____	____
	(9) Turned the timing adjustment nut two additional notches to the right.	____	____
	(10) Replaced backplate.	____	____
	(11) Cocked the weapon.	____	____
	(12) Repeated steps 4a thru g.	____	____
i.	Replaced the NO-FIRE gage with the FIRE gage.	____	____
j.	If firing pin released went to para 5.	____	____

	GO	NO-GO
k. If the firing pin did not release:		
(1) Removed the backplate.	____	____
(2) Turned trigger bar stop adjusting nut one notch to the right.	____	____
(3) Pushed up on trigger bar.	____	____
(4) If weapon fired, repeated steps 4a thru g.	____	____
(5) If weapon did not fire, repeated steps 4k(2) and (3) until weapon fired.	____	____
(6) Checked timing twice.	____	____
5. Performed a function check in sequence.	____	____
a. Set the safety switch to the S (safe) position.	____	____
b. Slid the locking selector on the M10 charger to the rear (lock) position.	____	____
c. Pulled back on the charger cable handle and locked the bolt to the rear.	____	____
d. Kept the charger cable handle pulled to the rear and moved the lock selector on the M10 charger to the forward (release) position.	____	____
e. Eased the bolt forward with the charger cable handle.	____	____
f. Pressed the trigger; did not release the firing pin.	____	____
g. Placed the safety switch to the F (fire) position.	____	____
h. Pressed the trigger and released the firing pin.	____	____
6. Loaded the machine gun in sequence.	____	____
a. Placed safety to the S (safe) position.	____	____
b. Opened machine gun cover.	____	____
c. Inserted the double loop of ammunition under extractor and pushed extractor down between first and second round.	____	____
d. Closed the cover.	____	____
7. Completed all performance measures within 15 minutes.	____	____

Student completed all requirements satisfactorily.

GO	NO-GO	INITIALS
____	____	____

EXACT TIME: _____ / 15 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 5

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

CLEAR, REMOVE, DISASSEMBLE, ASSEMBLE, INSTALL, AND PERFORM A FUNCTION CHECK AND A MODIFIED FIRING CIRCUIT TEST ON THE M68 GUN BREECHBLOCK

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Cleared the 105-mm main gun.	____	____
a. Set GUN/TURRET DRIVE switch to MANUAL.	____	____
b. Made sure GUN SELECT switch was set to TRIGGER SAFE.	____	____
c. Made sure TURRET POWER switch was set to ON.	____	____
d. Made sure spent case ejection arm was set to forward position and safe light illuminated on loader's control panel.	____	____
e. Made sure breechblock crank stop was to the rear and locked.	____	____
f. Opened breech and made sure chamber was clear.	____	____
Note: Breech does not have to be locked in open position.		
2. Removed the breechblock, crank pivot, and extractors.	____	____
3. Disassembled breechblock completely.	____	____
4. Assembled breechblock completely.	____	____
5. Installed breechblock, crank pivot, and extractors.	____	____
6. Performed a function check on the breechblock.	____	____
7. Observed all safety precautions during removal, disassembly, assembly, and installation of the breechblock.	____	____
8. Conducted modified firing circuit test in accordance with TM 9-2350-255-10-2, pp 2-229 and 2-230, steps b thru i.	____	____
9. Completed all steps in sequence within 14 minutes.	____	____

Student completed all requirements satisfactorily.	GO	NO-GO	INITIALS
	____	____	____

EXACT TIME: _____ / 14 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 6

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

BORESIGHT THE 105-MM MAIN GUN

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Boresighted the main gun IAW FM 17-12-1; Appendix B, Armament Accuracy Checks, Section I, Steps 1-28.	____	____
2. Observed all safety precautions.	____	____
3. Completed task within 17 minutes.	____	____

Student completed all requirements satisfactorily.	GO	NO-GO	INITIALS
	____	____	____

EXACT TIME: _____ / 17 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 7

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

PERFORM A REPLENISHER CHECK

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Performed a replenisher check in 2 minutes IAW TM 9-2350-255-10-2.	____	____
a. Elevated the main gun to maximum elevation using the manual controls.	____	____
b. Determined the replenisher level.	____	____
EXACT TIME: _____ / 2 Minutes		
2. If fluid level was below MINIMUM, performed the actions required to add replenisher fluid.	____	____
a. Loosened clamp with screwdriver and removed hose from plug.	____	____
b. Removed plug from replenisher and set aside for later use.	____	____
c. Removed hose from holding clips and ran it out through the loader's hatch.	____	____
	____	____
d. Using a small funnel, simulated adding hydraulic fluid until fluid reached full level.	____	____
e. Removed funnel and replaced hose on holding clips.	____	____
f. Replaced plug in replenisher.	____	____
g. Put hose on plug and tightened clamp with screwdriver.	____	____
3. If fluid level was at MINIMUM level or above, stated the actions required to bleed replenisher.	____	____
a. Depress main gun slightly below level position.	____	____
b. Using 15mm socket and handle, loosen bleed plug.	____	____
	____	____
c. Allow air to escape.	____	____
d. When fluid flows around plug, tighten with 15mm socket.	____	____
e. Recheck fluid level.	____	____

Student completed all steps satisfactorily.	GO	NO-GO	INITIALS
	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 8

CRITERION SCORING CHECKLIST FOR THE TANK CREW GUNNERY SKILLS TEST

LOAD THE 105-MM MAIN GUN

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Removed the 105-mm main gun round.	____	____
2. Loaded the main gun.	____	____
3. Cleared the path of recoil.	____	____
4. Placed the spent case ejection arm in the fire position and announced "UP."	____	____
5. Completed within 5 seconds.	____	____

Student completed all steps satisfactorily.	GO	NO-GO	INITIALS
	____	____	_____

EXACT TIME: _____ / 5 Seconds

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

PERFORM FAILURE-TO-FIRE (MISFIRE)
PROCEDURES ON THE 105-MM
MAIN GUN

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Announced "ON THE WAY."	____	____
2. Announced "MISFIRE."	____	____
3. Announced "ON THE WAY" and tried to fire using the trigger on the control handle that was not used initially.	____	____
4. Announced "MISFIRE."		
5. Told the TC to announce "ON THE WAY" and to attempt to fire using the trigger on the commander's control handle.	____	____
6. Announced "MISFIRE."	____	____
7. Announced "ON THE WAY" and tried to fire using the trigger on the manual elevating handle.	____	____
8. Announced "MISFIRE."	____	____
9. Set GUN SELECT switch to TRIGGER SAFE.	____	____
10. Attempted to fire using manual firing device (blasting machine).	____	____
*11. Announced "MISFIRE," waited 2 minutes, had the loader open the breech, and turned the round a half-turn (180°).	____	____

*This step is explained by the crewman. Do not wait the 2 minutes.

	GO	NO-GO
12. Placed GUN SELECT switch to MAIN.	____	____
13. Announced "ON THE WAY" and attempted to fire using any electrical trigger.	____	____
14. Round still did not fire; announced "MISFIRE."	____	____
15. Completed all steps in sequence within 3 minutes.	____	____

Student completed all steps satisfactorily.	GO	NO-GO	INITIALS
	____	____	_____

EXACT TIME: _____ / 3 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 10

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

PREPARE THE GUNNER'S STATION IN AN M1 TANK FOR OPERATION

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Requirement: Perform a zero pressure check.		
1. Set AUX HYDR POWER switch on commander's control panel to OFF.	____	____
2. Raised and lowered the main gun using power control handles.	____	____
3. Observed hydraulic pressure gage. Pressure should have slowly decreased to 750-700 psi and then dropped rapidly to 0.	____	____
4. Depressurized parking brake hydraulic system.	____	____
5. Checked reservoir sight gage for proper oil level.	____	____
6. Set AUX HYDR POWER switch on commander's control panel to ON. Listened for hydraulic pump operation and checked that pump shut off when pressure reached 1,500-1,700 psi on gage.	____	____
Second Requirement: Perform TIS checkout.		
1. Verified that THERMAL MODE switch was in STBY.	____	____
2. Placed FLTR/CLEAR/SHTR switch to SHTR.	____	____
3. Placed POLARITY switch to WHITE HOT.	____	____
4. Placed THERMAL MAGNIFICATION lever to 3X.	____	____
5. Placed UNIT TEST PATTERN switch to PCU and checked FAULT light. It should be on 5 seconds or less.	____	____
6. Looked through GPS and viewed range symbol at the bottom of GPS. (Adjust SYMBOLS rheostat if necessary.)	____	____
7. Placed UNIT TEST PATTERN to ICU and checked FAULT light. It should stay on 5 seconds or less.	____	____
8. Looked through GPS and viewed a test pattern with a darkened upper right quarter of picture.	____	____
9. Placed UNIT TEST PATTERN switch to EU.	____	____
10. Placed THERMAL MODE switch to ON.	____	____
11. Checked fault light. It should be on 5 seconds or less.	____	____
12. Looked through GPS; view had corner symbols, all symbols at the bottom were visible, and the range symbol showed 8s.	____	____
13. Placed THERMAL MAGNIFICATION lever to 10X.	____	____
14. Looked through GPS; view showed TIS reticle moving around and range symbols showed 8s in display window.	____	____
15. Placed UNIT TEST PATTERN switch to TRU and checked FAULT light. It should stay on for 5 seconds or less.	____	____

	GO	NO-GO
16. Looked through GPS; view had reticle in center area with vertical bar left of reticle and the range in the computer appeared at bottom of view.	____	____
17. Turned CONTRAST knob; verified bar brightened or dimmed as knob was turned.	____	____
18. Turned SENSITIVITY knob; verified display pattern brightened and dimmed as knob was turned.	____	____
19. Turned RETICLE knob; reticle got whiter or blacker as knob was turned.	____	____
20. Placed POLARITY switch to BLACK HOT; display pattern changed to show a dark bar on a light green background.	____	____
21. Placed POLARITY switch to WHITE HOT; display pattern changed to a light bar on a dark background.	____	____
22. Placed UNIT TEST PATTERN switch to OFF.	____	____
23. Verified thermal ballistic door was open.	____	____
24. Looked through GPS and laid main gun on a target 1,000 meters from the tank.	____	____
25. Turned CONTRAST, SENSITIVITY, and FOCUS knobs to adjust TIS for best image.	____	____
26. Manually entered a range of 2680 into the computer.	____	____
27. Turned SYMBOLS knob clockwise all the way, and looked into GPS eyepiece. Range should have read 2680.	____	____
28. Turned SYMBOLS knob counterclockwise to dim range symbol so it did not interfere with image of target.	____	____
29. Checked for "F" fire control fault symbol.	____	____
Third Requirement: Perform computer self-test.		
1. Made sure gunner's station was powered up.	____	____
2. Made sure hydraulic pressure gage read 1,500 to 1,700 psi.	____	____
3. Placed FIRE CONTROL MODE switch to EMERGENCY. Checked for drift. Gun and turret motion should not be present.	____	____
4. Placed FIRE CONTROL MODE switch to NORMAL.	____	____
5. Removed any drift.	____	____
6. Opened CCP door and pressed CCP power switch.	____	____
7. Squeezed and held palm switch.	____	____
8. Pressed TEST button.	____	____
9. PASS appeared in display window.	____	____
10. Released palm switch.	____	____
11. Closed CCP door.	____	____

	GO	NO-GO	INITIAL
Student completed all three requirements satisfactorily in 12 minutes.	____	____	____

EXACT TIME: _____ / 12 Minutes

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 11

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST
EVALUATOR GUIDE

ACQUIRE TARGETS THROUGH THE THERMAL IMAGING SYSTEM (TIS)

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Acquired the first target within 8 seconds.	____	____
EXACT TIME: _____ / 8 Seconds (Target 1)		
2. Acquired the second target within 8 seconds.	____	____
EXACT TIME: _____ / 8 Seconds (Target 2)		
3. Acquired the third target within 8 seconds.	____	____
EXACT TIME: _____ / 8 Seconds (Target 3)		
4. Acquired the fourth target within 8 seconds.	____	____
EXACT TIME: _____ / 8 Seconds (Target 4)		

	GO	NO-GO	INITIALS
Student acquired three of four targets within 8 seconds per target.	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 12

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

ENGAGE TARGETS WITH THE 105-MM MAIN GUN
FROM THE GUNNER'S STATION IN AN M1 TANK

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Requirement: Moving target engagement (GPS).		
1. Placed GUN SELECT switch to MAIN.	____	____
2. Selected correct ammunition.	____	____
3. Identified target.	____	____
4. Switched to 10X magnification.	____	____
5. Placed aiming circle on center mass of target, lased, and relayed aiming circle.	____	____
6. Announced "ON THE WAY" and fired.	____	____
7. Completed steps 5 and 6 within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 1)

Second Requirement: Battlesight engagement (GPS)		
1. Placed GUN SELECT switch to MAIN.	____	____
2. Selected correct ammunition.	____	____
3. Identified target.	____	____
4. Placed aiming circle on center mass of target.	____	____
5. Announced "ON THE WAY" and fired.	____	____
6. Completed steps 4 and 5 within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 2)

Third Requirement: Precision engagement using GAS.		
1. Placed GUN SELECT switch to MAIN.	____	____
2. Identified target.	____	____
3. Correct reticle (SABOT) was in GAS.	____	____
4. Placed proper range line on center mass of target.	____	____
5. Announced "ON THE WAY" and fired.	____	____
6. Completed steps 4 and 5 within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 3)

Fourth Requirement: Adjust fire from a subsequent fire command using GAS.		
1. Placed proper range line on center mass of target.	____	____
2. Announced "ON THE WAY" and fired.	____	____
3. Completed within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 4)

	GO	NO-GO	INITIALS
Student completed all steps for all requirements.	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

STATION 13

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

PREPARE A TANK SKETCH CARD FOR AN M1 TANK

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
1. Depicted three range bands (as designated by evaluator).	____	____
2. Depicted one key terrain feature per range band (per evaluator's answer sheet).	____	____
3. Depicted two mounted avenues of approach, per evaluator's answer sheet (an air avenue is acceptable as one of the avenues).	____	____
4. Depicted all preplanned fires per map; both HE and illumination depicted as target reference points.	____	____
5. Depicted all barriers (per map).	____	____
6. Depicted one reference point (per evaluator's answer sheet).	____	____
7. Depicted the sector limits as designated by evaluator.	____	____
8. Completed the sketch card in 6 minutes.	____	____

Note. Anything depicted outside the sector limits by the student is not required and should not be graded.

	GO	NO-GO
Student completed all steps satisfactorily.	____	____

TOTAL NUMBER OF FEATURES, AVES. OF APPROACH, AND REFERENCE POINTS DEPICTED: _____

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 14

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

ISSUE INITIAL AND SUBSEQUENT FIRE COMMANDS

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Requirement. Issued an initial fire command for a precision engagement that contained the correct data in the following sequence.	____	____
1. Alert.	____	____
2. Ammunition/weapon.	____	____
3. Description.	____	____
4. Execution.	____	____
5. Completed the command within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 1)

Second Requirement. Issued a subsequent fire command for a precision engagement that contained the correct data in the following sequence, in reaction to the strike of the round as designated by the evaluator to the student.	____	____
1. Alert.	____	____
2. Deflection correction.	____	____
3. Range correction.	____	____
4. Execution.	____	____
5. Completed the command within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target 2)

Third Requirement. Issued an initial fire command for a battlesight engagement that contained the correct data in the following sequence.	____	____
1. Alert.	____	____
2. "BATTLESIGHT."	____	____
3. Description.	____	____
4. Execution.	____	____
5. Completed the command within 5 seconds.	____	____

EXACT TIME: _____ / 5 Seconds (Target)

	GO	NO-GO	INITIALS
Student completed all requirements satisfactorily.	____	____	____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 15

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

ESTIMATE AND DETERMINE RANGE TO A TARGET

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Requirement. Estimated range to Tgt #_____.	_____	_____
1. Identified the target.	_____	_____
2. Estimated and announced the range within ±200 meters to the target.	_____	_____
3. Completed all steps within 6 seconds.	_____	_____

EXACT TIME: _____ / 6 Seconds (Target 1)

Second Requirement. Estimated range to Tgt #_____.	_____	_____
1. Identified the target.	_____	_____
2. Estimated and announced the range within ±200 meters to the target.	_____	_____
3. Completed all steps within 6 seconds.	_____	_____

EXACT TIME: _____ / 6 Seconds (Target 2)

Third Requirement Determined range using the laser range finder.	_____	_____
First Target.		
1. Identified the target.	_____	_____
2. Lased to target within ±10 meters.	_____	_____
3. Announced the range displayed in the GPS.	_____	_____
4. Completed all steps within 5 seconds.	_____	_____

EXACT TIME: _____ / 5 Seconds (Target 1)

Second Target.		
1. Identified the target.	_____	_____
2. Lased to target within ±10 meters.	_____	_____
3. Announced the range displayed in the GPS.	_____	_____
4. Completed all steps within 5 seconds.	_____	_____

EXACT TIME: _____ / 5 Seconds (Target 2)

	GO	NO-GO
Third Target.		
1. Identified the target.	____	____
2. Lased to target within ±10 meters.	____	____
3. Announced the range displayed in the GPS.	____	____
4. Completed all steps within 5 seconds.	____	____

EXACT TIME: _____/ 5 Seconds (Target 3)

Fourth Target.		
1. Identified the target.	____	____
2. Lased to target within ±10 meters.	____	____
3. Announced the range displayed in the GPS.	____	____
4. Completed all steps within 5 seconds.	____	____

EXACT TIME: _____/ 5 Seconds (Target 4)

Fifth Target.		
1. Identified the target.	____	____
2. Lased to target within ±10 meters.	____	____
3. Announced the range displayed in the GPS.	____	____
4. Completed all steps within 5 seconds.	____	____

EXACT TIME: _____/ 5 Seconds (Target 5)

	GO	NO-GO	INITIALS
Student completed all requirements satisfactorily.	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

STATION 16

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

PREPARE THE TANK FOR THREE-MAN CREW OPERATIONS AND
FIRE THE MAIN GUN FROM THE TANK COMMANDER'S POSITION

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Requirement. Prepare the tank for three-man crew operations.	____	____
1. Prepared TC's position to engage targets using the GPS extension.	____	____
2. Placed the magnification lever on the GPS to 10X.	____	____
3. Placed the FIRE CONTROL MODE switch in the NORMAL position.	____	____
4. Placed TIS in STBY or ON.	____	____
5. Selected ARM LAST RTN on the LRF.	____	____
6. Placed the GUN SELECT switch to MAIN.	____	____
7. Placed the AMMUNITION SELECT switch to position of loaded round.	____	____
8. Set the GUN/TURRET DRIVE switch to the POWERED position.	____	____
Second Requirement. Fire a precision engagement from the tank commander's position.	____	____
1. Issued fire command, "LOAD SABOT."	____	____
2. Made sure the AMMUNITION SELECT switch was set to the announced ammunition.	____	____
3. Listened for an "UP" from the loader.	____	____
4. Laid center mass of target, lased, announced "ON THE WAY," and fired.	____	____
5. Completed all steps within 8 seconds.	____	____

EXACT TIME: _____ / 8 Secon

Third Requirement. Fire a battlesight engagement from the tank commander's position. ____ ____

1. Issued fire command, "BATTLESIGHT." ____ ____
2. Made sure the AMMUNITION SELECT switch was set to the announced ammunition. ____ ____
3. Pressed the MANUAL RANGE/BATTLESIGHT button and checked the GPS extension to to ensure the indexed range was displayed. ____ ____
4. Listened for an "UP" from the loader. ____ ____
5. Laid center mass of target, announced "ON THE WAY," and fired. ____ ____
6. Completed all steps within 8 seconds. ____ ____

EXACT TIME: _____ / 8 Seco

Student satisfactorily completed all requirements.	GO	NO-GO	INITIALS
	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT ... EXTREMEL PROFICIE

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

_____

_____

_____

_____

STATION 17

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

LAY THE MAIN GUN ON TARGET

NAME _____ UNIT _____

GRADE _____ DUTY POSITION _____

	GO	NO-GO
First Engagement. Target # ____.		
1. Target was within GPS in 3X magnification.	____	____
2. Completed within 6 seconds.	____	____
EXACT TIME: _____ / 6 Seconds (Target 1)		
Second Engagement. Target # ____.		
1. Target was within GPS in 3X magnification.	____	____
2. Completed within 6 seconds.	____	____
EXACT TIME: _____ / 6 Seconds (Target 2)		
Third Engagement. Target # ____.		
1. Target was within GPS in 3X magnification.	____	____
2. Completed within 6 seconds.	____	____
EXACT TIME: _____ / 6 Seconds (Target 3)		
Fourth Engagement. Target # ____.		
1. Target was within GPS in 3X magnification.	____	____
2. Completed within 6 seconds.	____	____
EXACT TIME: _____ / 6 Seconds (Target 4)		
Student completed at least three of four requirements within time limit.	____	____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

STATION 18

CRITERION SCORING CHECKLIST FOR THE
TANK CREW GUNNERY SKILLS TEST

MOUNT, ADJUST THE EQUILIBRATOR, AND BORESIGHT THE
CALIBER .50 M2 HB MACHINE GUN
WITH THE COMMANDER'S WEAPON SIGHT

NAME _____ UNIT _____

GRADE _____ DUTY POSITION -- _____

	GO	NO-GO
First Requirement. Mount the weapon.		
1. Made sure the safety on the CWS elevation crank was set to SAFE.	____	____
2. Leveled commander's machine gun mount.	____	____
3. Locked commander's machine gun mount.	____	____
4. Placed machine gun receiver in mount.	____	____
5. Made sure machine gun butterfly trigger was under the mount firing lever.	____	____
6. Lined up receiver/mount holes and inserted mounting pins.	____	____
Second Requirement. Adjust the equilibrator.		
1. Depressed the weapon to maximum depression.	____	____
2. Made sure locking lever was positioned for caliber .50 operation.	____	____
3. Loosened equilibrator locknut.	____	____
4. Adusted equilibrator by turning (with the adjustable wrench) the equilibrator adjusting bolt only.	____	____
5. Checked for smooth and equal effort in depression and elevation.	____	____
6. Tightened equilibrator locknut.	____	____
Third Requirement.		
A. Boresight the machine gun (without caliber .50 boresight device).	____	____
1. Made sure the bolt was forward.	____	____
2. Removed rear mounting pin and lifted rear of machine gun above the firing lever.	____	____
3. Removed backplate.	____	____
4. Removed bolt group from weapon.	____	____
5. Lowered machine gun and reinserted rear mounting pin.	____	____
6. Aligned center of barrel on target upper left hand corner.	____	____
Note. Steps 7 thru 12 are performed on the commander's weapon sight.		
7. Loosened setscrew with the 9/64-inch socket head key to allow for turning of horizontal adjustment control screw.	____	____
8. Adjusted vertical line of boresight cross on the left edge of target using the flat-tip screwdriver.	____	____

9. Tightened setscrew with the 9/64-inch socket head key to lock horizontal adjustment control screw. ____ ____

10. Loosened setscrew with the 9/64-inch socket head key to allow for turning of vertical adjustment control screw. ____ ____

11. Adjusted horizontal line of boresight cross on top edge of target using the flat-tip screwdriver. ____ ____

12. Tightened setscrew with the 9/64-inch socket head key to lock vertical adjustment control screw. ____ ____

13. Repeated step 2. Replaced bolt group and back-plate and repeated step 5. ____ ____

14. Completed within 18 minutes. ____ ____

Exact Time: _____/18 minutes

B. Boresight the machine gun (with caliber .50 boresight device). ____ ____

1. Made sure bolt was forward. ____ ____

2. Inserted caliber .50 boresight device. ____ ____

3. Aligned caliber .50 boresight device reticle on target upper left hand corner. ____ ____

Note. Steps 4 thru 9 are performed on the commander's weapon sight.

4. Loosened setscrew with the 9/64-inch socket head key to allow for turning of horizontal adjustment control screw. ____ ____

5. Adjusted vertical line of boresight cross on the left edge of target using the flat-tip screwdriver. ____ ____

6. Tightened setscrew with the 9/64-inch socket head key to lock horizontal adjustment control screw. ____ ____

7. Loosened setscrew with the 9/64-inch socket head key to allow for turning of vertical adjustment control screw. ____ ____

8. Adjusted horizontal line of boresight cross on top edge of target using the flat-tip screwdriver. ____ ____

9. Tightened setscrew with the 9/64-inch socket head key to lock veritical adjustment control screw. ____ ____

10. Removed caliber .50 boresight device. ____ ____

11. Completed within 15 minutes. ____ ____

Exact Time: _____/15 minutes

	GO	NO-GO	INITIALS
Student completed all requirements satisfactorily.	____	____	_____

TASK PROFICIENCY: 1 2 3 4 5

NOT PROFICIENT — EXTREMELY PROFICIENT

EVALUATOR _____

OFFICER IN CHARGE _____

DATE TESTED _____

REMARKS: _____

DEFINITION OF SCALE VALUES:
TASK PROFICIENCY

5 - EXTREMELY PROFICIENT

- This soldier has COMPLETE KNOWLEDGE of how the task should be performed and is able to PERFORM THE TASK TO THE LETTER WITHOUT even the slightest hint of ERROR. A soldier with this level of familiarity KNOWS THE PROPER SEQUENCE OF EACH REQUIREMENT and PERFORMS THE ENTIRE TASK in a COMPLETELY CONFIDENT manner WITHOUT HESITATION.

4

3 - SOMEWHAT PROFICIENT

- This soldier has CONSIDERABLE KNOWLEDGE of how the task is performed and PERFORMS THE TASK WITHOUT A SCORABLE ERROR. This soldier KNOWS THE PROPER SEQUENCE of most requirements and PERFORMS most tasks IN A CONFIDENT MANNER, SELDOM HESITATING as he completes the task.

2

1 - NOT PROFICIENT

- This soldier has LIMITED KNOWLEDGE of how the task should be performed and/or MAKES SOME ERRORS IN PERFORMING the task. This soldier NEEDS PROMPTING to perform the task in sequence and SHOWS SOME HESITATION as he completes the task.

FKFU 85-6

Working Paper

ANNOTATED BIBLIOGRAPHY
OF
ARMY RESEARCH INSTITUTE PUBLICATIONS 1980 - AUGUST 1984

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November 1985

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This annotated bibliography is an update of a 1980 summary of Army Research Institute-Fort Knox Field Unit publications.

This bibliography contains works that have been or are in the process of being accepted as Army Research publications. Papers are not included. Field Unit Working Papers are not included.

Sources were authors, Field Unit records, and DTIC. Items with an AD number may be ordered direct from DTIC. Publications without an AD number may be obtained from Army Research Institute, Fort Knox Field Unit.

The arrangement is by year, then alphabetically by principal author. An authors index is included.

1. Bessemer, D.W. & Kottas, B.L. Use of computer statistical packages to generate quality control reports on training. ARI Research Product 80-3. January 1980. (AD A086 085)

Obtaining timely and efficient training management information using limited computer resources and commercially available statistical packages may be difficult in practice. The Training Monitoring System (TRAMS) uses the statistical package for the Social Sciences to provide graphic summaries and statistical analysis of personnel attitudes before, during, or after training and can also evaluate changes in attitudes over training. TRAMS takes input from cards during batch processing and produces graphic displays similar to quality control charts. The output allows a rapid detection of deviant samples and systematic changes in attitudes over time. The system is readily adaptable to evaluation of training data other than attitudes, such as test scores, and easily provides ongoing monitoring of training results.

2. Campbell, C.H., Harris, J.H. & Bessemer, D.W. Training materials and data requirements for unit conduct of fire trainer (U-COFT) training test support plan. HumRRO-RP-MTRD-80-18, ARI RP-81-8, August 1980. (AD A125 673)

Recognizing both the potential benefits and the potential risks associated with the use of training devices and simulators as adjuncts and substitutes for operational equipment, the Army has evolved a multi-tiered assessment policy, in which plans and devices are evaluated at successive phases of development, from concept evaluation to operational testing. The material presented in this training TSP for the XM1 UCOFT was developed in response to the test concept for OT II to answer three of the operational issues asked in the IEP for the UCOFT. These answers will be used in the decision to continue into the production stage of the UCOFT and to select a production source. The three operational issues are: The training effectiveness of each of the three XM1 training alternatives in sustaining gunnery proficiency of XM1 Gunners and Commanders; The transfer effectiveness of the three XM1 training alternatives in sustaining gunnery proficiency of XM1 Gunners and Commanders; and the training resources required for each of the three XM1 training alternatives.

3. Campbell, R.C. A crew drills training program for M60A1 tank gunnery: Company Commander's Manual. HumRRO FR-MTRD-(KY)-80-14, September 1980.

Provides a training strategy for Armor units in conducting low cost dry fire crew drills to bridge the gap between individual gunnery tasks and live fire gunnery. Twenty drills are presented that are applicable to M60A1, M60A1(AOS), and M48A5 Tanks for Normal, Emergency, Degraded, and Team Gunnery. Each drill activity is presented by means of a crewman specific flow chart of activities. Information is presented for establishing conditions

prior to each drill and for ensuring prerequisite individual and team training has been met. The basis for informal evaluation is provided. Information on implementation of the program at unit level is presented for the company commander, platoon leader, and tank commander. The training program has not been empirically verified. Work is based on a similar training program developed by ARI for the XM1 tank.

4. Campbell, R.C. Design and development of diagnostic measures for armor crewman performance-XM1. ARI Research Note 81-11. HumRRO FR-MTRD-(KY)-80-9. September 1980. (AD A125 895)

Individual and crew tests are necessary to support XM1 tank gunnery goals and to reduce ammunition expenditures by assuring proficiency exercises. This research was focused on developing diagnostic tests for individual crewman and crew performance evaluations for crew drills that are administerable at platoon level within four hours and do not involve live fire. Nineteen individual tests were developed and remediation guidance was developed that is centered on immediate correction of specific deficiencies. For crew performance, the 14 Crew Drills contained in ARI Research Product 79-17, A prototype crew drills training program for XM1 tank gunnery: Company Commander's Manual, were analyzed and three drills were selected that best represent the range of gunnery behavior. Tests were developed for those three drills and remediation guidelines were prepared that focus on crew performance. Supporting material for platoon leaders and tank commanders who serve as scorers was also developed. The testing material to be issued in the unit is included as an appendix.

5. Harris, J.H., Bessemer, D.W. & McAleese, K.J. Training materials and data requirements for Combat Training Theater (CTT) training test support plan. ARI Research Product 81-13. HumRRO RP-MTRD-(KY)-81-3. December 1980. (AD A125 378)

The material presented in this research project for the Combat Training Theater (CTT) was developed in response to the Independent Evaluation Plan (IEP) test concept to answer three of the operational issues asked in the IEP for the CTT. The three issues are: (1) The training effectiveness of the training alternatives (in developing and sustaining main gun engagement proficiency), (2) The transfer effectiveness of the training alternatives, (3) The cost of training with each alternative.

6. Harris, J.H., Campbell, C.H., Kraemer, R.E. & Bessemer, D.W. Development of training objectives for XM1 UCOFT. ARI Research Product 81-6, HumRRO RP-MTRD-(KY) 80-15. January 1980. (AD A125 757)

This research product contains the training objectives for the XM1 Unit Conduct of Fire Trainer (UCOFT). The objectives were developed for both the Gunner and Tank Commander positions and include gunnery and gunnery related tasks whose learning is expected to be promoted by practice using the UCOFT. The objectives may be viewed as both specifying what the UCOFT is supposed to do and identifying expectations as seen by designers and prospective users.

7. Kottas, B.L. & Bessemer, D.W. Comparison of potential critical feature sets for simulator-based target identification training. ARI Technical Report 510. September 1980. (AD A128 344)

Effective representation of armored vehicles in simulation displays demands a careful evaluation of human perceptual capabilities. This is especially true for computer-generated target displays, which must provide sufficient detail to allow vehicle identification within limitations of computer processing timed display resolution. Even in image generation and display systems not incurring such limitations, the image detail should not exceed human perceptual and cognitive information processing capabilities. Care must be given to vehicle representation to assure that the features represented and emphasized are those most valuable for identifying targets. The current research compared the effectiveness of two different sets of vehicle features for target identification training. Results showed that the two sets of features, in the context of the training in which they were embedded, produced equivalent levels of target identification accuracy, and both produced large gains in performance. Results also revealed that any effects due to range-specific learning of features were very small relative to the improvement produced by training, and were significant when data for one of the programs were analyzed separately.

8. Schulz, R.E. & Farrel, J.R. Job Aids: Descriptive authoring flowcharts for Phase I-Analysis of the Institutional Systems Development model. ARI Research Product 80-13. May 1980. (AD A088 918)

The purpose of the research was to develop job aids ("how-to do it" guidance) for the activities identified in the Instructional Systems Development (ISD) model (TRADOC Pamphlet 350-30). Job aids are available for each of the five phases of the ISD model--ANALYZE, DESIGN, DEVELOP, IMPLEMENT, and CONTROL. Each job aid is composed of a descriptive authoring flowchart and a job aid manual. This volume covering Phase I--ANALYZE, contains an introduction to the use of the job aids, and the descriptive authoring flowcharts for Blocks I.2 through I.5. The supplementary job aid manuals for Phase I are available in a companion document.

9. Schulz, R.E. & Farrel, J.R. Job aid manuals for Phase, I--ANALYZE of the Instructional Systems Development Model. ARI Research Product 80-14. May 1980. (AD A088 919)

This volume of the ISD series covering Phase I--ANALYZE contains an introduction to the use of the job aids, and the job aid manuals for Blocks I.2 through I.5.

10. Schulz, R.E. & Farrel, J.R. Job aids: Descriptive authoring flowcharts for Phase II--DESIGN of the Instructional Systems Development Model. ARI Research Product 80-15. May 1980. (AD A088 417)

This volume of the ISD series covers Phase II--DESIGN, and contains an introduction to the use of the job aids, and the descriptive authoring flowcharts for Blocks II.1 through II.4.

11. Schulz, R.E. & Farrel, J.R. Job aid manuals for Phase II--DESIGN of the Instructional Systems Development Model. ARI Research Product 80-16, May 1980. (AD A088 920)

This volume of the ISD series covers Phase II--DESIGN, with an introduction to the use of job aids, and the job aid manuals for Blocks II.1 through II.4.

12. Schulz, R.E. & Farrel, J.R. Job aids: Descriptive authoring flowcharts for Phase III-DEVELOP of the Instructional Systems Development Model. ARI Research Product 80-17. May 1980. (AD A088 921)

This volume of the ISD series covers Phase III--DEVELOP. In addition to an introduction to the use of the job aids, it contains Blocks III.1 through III.5.

13. Schulz, R.E. & Farrel, J.R. Job aid manuals for Phase III--DEVELOP of the Instructional Systems Development Model. ARI Research Product 80-18. May 1980. (AD A088 922)

This volume of the ISD series covers Phase III-DEVELOP with an introduction to the use of the job aids, and the job aid manuals for Blocks III.1 through III.5.

14. Smith, D.A., Bessemer, D.W. & Harris, J.H. Training materials and data requirements for the BT-41 Fire Simulator Test Support Package (TSP). ARI Research Product 81-14. HumRRO RP-MTRD-(KY)-81-4. October 1980. (AD A126 046)

The TSP recommends procedures for training a group of soldiers with the BT-41, conducting tests to measure the effects of that training, conducting tests to measure the transfer that training provides to other equipment, and comparing the results of soldiers trained with this device to the results of soldiers trained on comparable conventional equipment. The general approach to training used in this TSP was to develop training procedures which are organized in stages similar to the Gunnery tables used in conventional gunnery training, but with a more gradual transition from easy component tasks to difficult, complex tasks within each stage. In addition, the kind of training scenarios and target used were chosen to maximize the advantages of the BT-41. The general approach to testing used in this TSP was: (1) To construct a design which would provide for the clear separation of training and transfer effects, and (2) assure comparable treatment of the two groups (i.e., the experimental group which is trained with the BT-41, and the control group which is trained with conventional equipment), in all respects except those intended to be evaluated, and (3) to develop measures which would be sensitive to training and transfer of benefits derived from the advantages summarized above.

15. Bauer, R.W. Review of methodologies for analysis of collective tasks. ARI RR 1329. May 1981.

The state-of-the-art in methodologies for analysis of collective tasks was examined in a literature review and a survey of US Army Centers and Schools. Current concepts and principles in analytic methods were compared. A brief survey of collective analyst personnel at seven Army Centers indicated prevailing analytic activities and needs. An annotated terminology list was included in an appendix.

16. Bauer, R.W. & Hahn, W.D. High mobility driver performance analysis. ARI RR 1306. June 1981. (AD A108 723)

The Combat Vehicle Technology Program's High Mobility Agility (HIMAG) Vehicle Chassis Tests, conducted in 1978 and 1979, provided an opportunity to explore the prediction of human performance requirements and the implications of high mobility tracked vehicle design for driver performance. Preliminary analysis and projections, based on the vehicle concept during construction, were compared with data gathered during driver training and 10 kilometer testing. Results supported the general hypothesis that cross-country driving on the higher horsepower per ton vehicles was significantly different from the same task on the M60A1 or M113. Course speeds, driver throttle use, driver errors, and critical incidents showed a differential pattern on HIMAG trials. Human factors and human engineering design deficiencies in the driver compartment, some of which were predicted in preliminary analysis and training but were not resolved, probably limited HIMAG speed and maneuver.

17. Black, B.A. & Kraemer, R.E. XM1 gunnery training and aptitude requirements analyses. ARI RP 81-5. February 1981. (AD A102 885)

This research compared, by crew position and by task, the gunnery training and aptitude requirements of the XM1 and the M60A1 tank systems. Task inventories were prepared for each crew position in the XM1 as well as for tasks which required interaction among crewmembers. A comparability analysis identified XM1 tasks posing potential training or aptitude problems and proposed tentative solutions. In addition, the location where specific XM1 tasks would be trained was identified, e.g., in One Station Unit Training or in operational units. Findings from the XM1/M60A1 comparability analyses include: (a) the majority of XM1 tasks which are directly analogous to M60A1 tasks are easier to perform on a fully operational XM1 tank while performance of these same tasks on a non-fully-operational XM1 is almost identical in difficulty to M60A1 tasks; (b) tasks which are unique to the XM1 are often difficult on a fully operational XM1 and almost always very difficult on a non-fully-operational XM1; and (c) automation in XM1 equipment design has made operator task performance during normal target engagements easier, but has conversely increased the scope and complexity of pre-operational tasks under normal and degraded conditions.

18. Burnside, B.L. Field performance feedback-A Problem review. ARI RR 1323. August 1981. (AD A134 388)

This report provides background information for training developers and evaluators on methods for collecting field performance feedback information. Six feedback methods are discussed based upon a review of the available literature, data from previous research, and structured interviews of seven battalion commanders at Fort Knox, KY. Major issues relating to an integrated feedback system and recommendations for future research in this area are addressed.

19. Campbell, C.H. & Harris, J.H. Design institutional and unit sustainment training programs for XM1 armor crewmen. ARI RP-81-12. January 1981. (AD A125 429)

In an effort to reduce the costs and increase the efficiency of initial and sustainment training of XM1 armor crewmen, the Army is exploring the use of simulators for driving and tank gunnery. Assessment of transfer of training to operational equipment and estimation of the predictive validity of proficiency on a simulator are addressed empirically by the Army's operational testing system for device evaluation. The purpose of this report is to present the products prepared in response to the Task 1 and Task 2 requirements for Mission-Based Simulation and Training Requirements to design institutional training for XM1 driving and gunnery, and unit sustainment training for XM1 gunnery. Specifically, three products are presented: Capabilities analyses for XM1 armor crewman training devices; Recommended training program for XM1 armor crewman institutional training; Recommended unit sustainment training program for XM1 gunnery.

20. Drucker, E.H. & O'Brien, R.E. Mission-based analyses of armor training requirements. Volume I: Final Report. HumRRO FR-MTRD-(KY)-81-2. Submitted as ARI RN. February 1981.

A detailed analysis was conducted of armor operations to provide the basis for developing a set of platoon drills for combined individual and collective armor training. The analysis provided information on the stages of armor operations, the individual and collective tasks that are performed during each stage, training objectives for these tasks, leadership tasks that are performed during each stage, and the types of factors that affect armor operations during combat.

21. Goldberg, S.L., Drillings, M. & Dressel, J.D. Mastery Training: Effect on skill retention. ARI TR 513. March 1981. (AD A120 762)

The objective of the research is to determine the effects of mastery training and length of retention interval on retention of a procedural skill. Armor crewmen were individually trained to boresight and zero the main gun of the M60A1 tank. Crewmen were trained to either of two criteria: One correct performance (standard training) or three consecutive correct performances (mastery training). Crewmen's retention of the task was tested either one or five weeks after training. Each step of the task performance was scored GO

or NO GO. When a crewman performed a step incorrectly, the scorer would correct the step before permitting the crewmen to continue. The results indicate a significant effect of both amount of training and length of retention interval on recall of the task, but no interaction between the variables. Crewmen perform better on the retention test after the shorter retention interval or after more intensive training. Differences in performance among the groups are mostly caused by differences on the first retention trial. There is no correlation between ability to perform or retain the task and mental category. The reason for this result may be the lack of variance among crewmen's mental categories.

22. Kane, J.J. Personnel and training subsystem integration in an armor system. Science Applications, Inc., McLean, VA. January 1981. ARI RR 1303. (AD A109 202)

This study conducted an audit trace of the personnel and training subsystem development of the XM1 Abrams Tank System as a case study of the major systems acquisition process. From this case study, lessons learned from the XM1 experience have been formulated that may be helpful in developing recommendations for improving personnel and training subsystem integration in the Army Life Cycle System Management Model (LCSMM). The scope of the study was restricted to personnel and training issues that occurred between program initiation and ASARC III. Other events in the XM1 development process were included only if they had a major impact on personnel and training issues or were required to make the development process comprehensible.

23. Knerr, C.M., Keller, S.D. & Laurance, J.H. Training strategies for the M1 Abrams tank driver trainer, HumRRO Final Report, FR-MTRD-(KY)-81-18. December 1981 (submitted to ARI as RR May 1984).

The research objective was to develop guidelines for applying the M1 Abrams tank driver trainer (DT) to train tank drivers, including determining tasks trained, developing rules for applying the training device features, and integrating the DT into the Armor program of instruction. The research classified the DT tasks according to the Training Effectiveness Prediction Model which prescribes learning guidelines based on the behavioral activities, conditions, standards, and feedback of the tasks. Most of the tasks are procedural, but many of the procedures require voice communications or decision making or both. One set of the DT programs presents the continuous movement tasks of driving such as steering. Some learning guidelines are common to all DT tasks (e.g., providing active practice and feedback) while others are specific to the type of task (e.g., high fidelity, continuous feedback for continuous movement tasks). Potential DT features pertain to all tasks (e.g., scoring improvements) or to specific tasks (e.g., increasing the number and repetition of decision making tasks). Integration of the DT into the program of instruction considers use of the M1 tank technical manual, new programs orienting the trainee to the driving block of instruction and the driver's intercom, and changes in the device hardware and software.

24. Kristiansen, D.M. A job aid for modifying ineffective or inefficient training programs. ARI RP 81-17. September 1981. (AD A120 774)

This job aid addresses the problem of how to modify a training program when the need for changes has been identified through a Training Program Evaluation. These changes are changes to the training process rather than the subject matter of training. It is one of four job aids designed to formally evaluate the effectiveness and efficiency of the training process. The other three job aids in the set are: Research Product 81-15, A Job Aid for the Systematic Evaluation of Lesson Plans, Research Product 81-16, A Job Aid for the Structured Observation of Training, and Research Product 81-18, Guidelines for Conducting a Training Program Evaluation. Guidance is provided on the development of training objectives, the conduct of practice events in training, providing feedback or knowledge of results, making training more efficient, and for modifying training programs to change the training environment, lecture/demonstration/practice events, and testing.

25. Kristiansen, D.M. & Witmer, B.G. A job aid for the systematic evaluation of lesson plans. ARI RP-81-15. September 1981. (AD A121 119)

This job aid addresses the problem of evaluating lesson plans with regard to the adequacy of the training prescriptions (description of the training events or learning experiences) contained in these plans. It is one of four job aids designed to formally evaluate the effectiveness and efficiency of the training process. The other three job aids in the set are: Research Product 81-6, A Job Aid for the Structured Observation of Training, Research Product 81-17, A Job Aid for Modifying Ineffective of Inefficient Training Programs, and Research Product 81-18. Guidelines for Conducting a Training Program Evaluation.

26. Kristiansen, D.M. & Witmer, B.G. Guidelines for conducting a training program evaluation. ARI RP-81-18. September 1981. (AD A120 775)

Training Program Evaluation (TPE) is a systematic method for identifying and correcting training program deficiencies by collecting and analyzing information on the training objectives, soldier test performance, and the process used in training and testing the soldiers. TPE is documented in four job aids that include: (1) procedures for planning the training program evaluation; (2) guidance in using and evaluating the information provided in the lesson plans; (3) forms and procedures for observing training and testing as they are conducted; (4) methods for analyzing training, testing, and performance data in order to identify training program deficiencies; and (5) guidance in modifying training programs on the basis of problems discovered during training program evaluation. This job aid (Research Product 81-18) provides guidelines for conducting the overall evaluation, including guidance on using the other three job aids. The other three job aids in the set are: Research Product 81-15, A Job Aid for the Systematic Evaluation of Lesson Plans; Research Product 81-16, A Job Aid for the Structured Observation of Training; and Research Product 81-17, A Job Aid for Modifying Ineffective or Inefficient Training Programs.

27. Melching, W.H., Osborn, W.C. & Bessemer, D.W. Field Evaluation of the ESSLR and CESSLR Devices. ARI RN-81-23. August 1981. (AD A126 144)

The range estimation capabilities of two eye-safe filters (densities of 2.9 and 5.5) for the M60A3 rangefinder were evaluated under specified conditions of target distance, target reflectivity, and target angle. Both filters were able to range targets out to at least 2000m when targets were enhanced with appropriate reflective materials. While both filters may be useful in tank gunnery training, only the 5.5 density filter can be used in freeplay exercises based on safety conditions.

28. Morrison, J.E. & Bessemer, D.W. Training and retention of armor machinegun tasks. ARI RR-1317. May 1981. (AD A128 824)

Platoons within three Armor One Station Unit Training (OSUT) companies were assigned to one of three M85 training schedules; a single four-hour block, two four-hour blocks received in one day, or two four-hour blocks separated by at least one week. One of the three companies was also shown videotaped demonstrations of M85 tasks. GO/NO GO data on M85 and M240 tasks were gathered by evaluators from the Directorate of Plans and Training (DPT) at Fort Knox. M85 performance was measured at the end of the OSUT cycle, whereas M240 scores were gathered at both mid- and end-of-cycle tests. In addition to GO/NO GO performance, ARI data gatherers collected execution times on M240 tasks. The findings included: (a) no effect of training schedule and introduction of videotaped demonstrations on M85 task performance or M240 retention; (b) poor performance on M85 mechanical training tasks which the OSUT personnel did not expect on the end-of-cycle test; (c) reliable decreases in M240 performance between mid- and end-of-cycle tests; and (d) task execution times revealed subtle changes in performance not shown by GO/NO GO scores.

29. O'Brien, R.E. & Drucker, E.H. Mission-based simulation and training requirements. HumRRO FR-MTRD-(KY)-81-2. February 1981. Volume 2-Armor operation time sequences; Volume 3-Leadership tasks performed during tank platoon operations; Volume 4-Crewman tasks performed during tank platoon performance; Volume 5-Relationships among collective and individual tasks in tank platoon operations; Volume 6-Training objectives for tank platoons and crews.

Volume II-An analysis of armor operations was conducted to identify, classify, and interrelate the activities performed during tank platoon missions. This volume contains diagrams and flowcharts illustrating the sequence of activities occurring during tank team and tank platoon operations. Volume 3-Contains lists of leadership tasks performed by platoon leaders, platoon sergeants, and tank commanders during the tank platoon operations identified in the analysis. Volume 4-Contains lists of crewman tasks performed during tank platoon performance.

30. Witmer, B.G. A job aid for the structured observation of training. ARI RP 81-16. September 1981. (AD A120 773)

This job aid was developed in response to the Army's need for a simple guide for persons whose job it is to collect data for evaluating training programs. The job aid structures the manner by which training observers collect their data by telling them what to look for during the conduct of training and testing. Data on the procedures used for training and testing are recorded on pre-printed worksheets that list the observations to be made. The worksheets described in this job aid include the: (1) Training Plan Worksheet, (2) Training Environment Worksheet, (3) Training Observation Worksheet, and (4) Testing Observation Worksheet. For each worksheet, the items comprising the worksheet are identified and defined, and directions are given on how to use the worksheet in observing training. This job aid is one of four job aids designed to formally evaluate the effectiveness and efficiency of the training process. The other three job aids in the set are: Research Product 81-15, A Job Aid for the Systematic Evaluation of Lesson Plans, Research Product 81-17, A Job Aid for Modifying Ineffective or Inefficient Training Programs, and Research Product 81-18, Guidelines for Conducting a Training Program Evaluation.

31. Yore, B.J., Drucker, E.H. & O'Brien, R.E. Training objectives for the XM1 loader, Vol. VII. HumRRO FR-MTRD-(KY)-81-2. February 1981. Submitted as ARI RN.

An analysis of Armor operations was conducted to identify, classify, and interrelate the activities performed during tank platoon missions. This volume contains training objectives for the M1 loader.

1982

32. Biers, D.W. & Sauer, D.W. Job sample tests as predictors of M1 gunnery performance. ARI TR-584. December 1982. (AD A139 433.) ARI RN-83-32, Appendixes A-E. September 1983. (AD A135 879)

The objectives of Phase I of this research was to develop an aptitude measurement which could be used to design job sample tests for armor crewmen; apply the methodology to develop job sample tests; and administer the job sample tests to armor crewmen and analyze the test data. Phase II, reported separately, included analyses of the predicted validity of the job sample tests. A five-stage methodology for job sample test design was developed. Stages included task identification; task prioritization; job sample dimensional analyses; trade-off analyses; and detailed job sample test development. Seven job sample tests, three computer-based and four hands-on tests, were developed using the methodology. They were Operate Computer Panel, Computer Tracking, Computer Target Engagement, Tank Commander Decision Making, Hands-On Gun Laying, Hands-On Tracking, and Hands-On Target Engagement. Tests were administered to armor crewmen stationed in Europe. The analysis of test data indicated a low degree of intercorrelation among job sample tests which suggested that they were measuring different gunnery behaviors.

33. Burnside, B.L. Subjective appraisal as a feedback tool. ARI TR-604. May 1982. (AD A138 873)

This report examines the accuracy of subjective appraisals of several aspects of task performance, including proficiency, difficulty, frequency, and criticality. The relative accuracy of subjective appraisals collected from various sources by various methods is discussed, and suggestions are developed for ways to increase the accuracy of these appraisals. The use of subjective data in an integrated feedback system is addressed, and suggestions for further research are offered. Findings should be of interest to training developers and evaluators.

34. Campbell, C. & Black, B. Predicting trainability of M1 crewmen. HumRRO FR-MTRD-(KY)-82-7. ARI TR-592. October 1982. (AD A138 933)

The purpose of this research was to examine ASVAB (Armed Services Vocational Aptitude Battery) and non-ASVAB measures as potential predictors of M1 training performance. Ten subtests, the aptitude area scores CO (Combat Operations) and GT, and AFQT (Air Force Qualification Test) were taken from the ASVAB. Five variables tapped the soldiers' backgrounds and personal characteristics. Five job sample tests were also used: tracking, target acquisition, fire control computer, use of the TM, and round sensing. Criteria included OSUT GATE scores, time and accuracy (hits) on firing of Table VII and instructor ratings of trainees, as well as two composite criteria. Data collection was conducted among 146 soldiers in the first two M1 OSUT classes at Fort Knox. The analyses involved a series of multiple regressions, first on the ASVAB subtests and then on the remaining measures. Regression equations that reliably predicted criterial were cross-validated between OSUT using both regression weighted and unit weighted models.

35. Campbell, R.C., Taylor, E.N. & Campbell, C.H. Crew performance requirements for emerging armor weapons systems: Studies of crew size and methods of forecasting human factors. ARI RN 82-21. January 1982. HumRRO-MTRD-(KY)-82-2. (AD A127 921)

The purpose of this research was to examine (a) the effects of operating a lightweight armor combat vehicle with crew of varying size, and (b) the effectiveness of two methods of forecasting human factors and training requirements for the same weapon system. In Study I, experienced armor crewmen responded to questions about the impact on system performance of reductions in number of crewmen from four to three or two. The opinion data together with results of a literature review suggest that, if a combat vehicle design employs automation and control-and-display redundancy well, three men in a crew may not only be ample but perhaps superior to a four-man crew; a reduction to two men would in the judgment of the experts, be too extreme, producing some degradation in system effectiveness and crewman confidence. In Study II, estimates of personnel requirements for the experimental weapon system were made by armor experts who were provided documents descriptive of the system but who had no first-hand experience with it. Their estimates, regardless of the kinds of descriptive materials used, did not differ significantly from judgments of the same requirements made by crewmen experienced with the weapon system. In task areas where estimates of time to

perform were compared with observed performance time, the armor experts tended to overestimate time to perform; the shorter the actual time, the greater the overestimate.

36. Drucker, E.H., O'Brien, R.E. & Bauer, R.W. Guidelines for preparing armor platoon drills and tactical leadership exercises. Vol. I: Final Report, ARI TR-568. HumRRO FR-TRD-(KY)-82-10. December 1982. (AD A137 339)

The purpose of this research was to adapt drill development guidelines so that they would be suitable for use by armor units, to incorporate tactical platoon leader training into these guidelines, and to implement the revised methodology for drill development by preparing a set of drills for tank platoons and leadership exercises for tank platoon leaders. A review was conducted of the drill development guidelines prepared by ARI and by TRADOC. The need for modified and new guidelines for armor training was determined. Supplemental guidelines were prepared including guidelines for the preparation of tactical leadership exercises for platoon leaders, and the guidelines were implemented in the preparation of a prototype battle exercise comprised of tank platoon drills and platoon leader exercises. In addition, assistance was provided to the ARI Field Unit at Fort Knox and to the Directorate of Training Development of the US Army Armor School in the preparation of armor platoon drills based on the Division 86 concept.

37. Goldberg, S.L. & Campbell, C.H. A comparative evaluation of M1 tank procedure guides. ARI RR 1342. September 1982. (AD A141 794)

The purpose of this research was to evaluate M1 tank procedure guides developed by the Army Research Institute as aids in performance of procedural tasks. Twelve tasks, three for each of the four crew positions, were tested among 27 soldiers completing initial training at Fort Knox and 35 soldiers in M1 crews at Fort Hood. Soldiers used either the tank operator's manual (TM), the ARI procedure guides, or the TM checklist during task performance. Criterion measures included performance accuracy, measured as percent of steps passed and as GO or NO GO for the task as a whole and time to locate tasks in each job aid. Overall, performance using the procedure guides was as accurate as performance using the TM or the checklist. Time required to locate procedures in the procedure guides was less than was required by the TM, and not different from the time required by the checklist. Soldiers' comments indicated that the procedure guides would be well-received by M1 crewmembers. In order to be effective, use of the guides during task performance must be introduced in training as soon as task familiarity using the TM is achieved. Command emphasis in units would then have to require continued use of the guides in performance of noncombat procedural tasks.

38. Harris, J.H., Goldberg, S.L. & Morrison, J.E. Stabilized gunnery training techniques. ARI RP 82-5. February 1982. (AD A130 909)

A training program to provide elementary skill in M60A3 stabilized gunnery was developed. The program, centered around 14 analytically-derived principles of stabilized gunnery, is in three parts. The first, a knowledge

videotape, familiarizes soldiers with patterns of reticle movement and demonstrates the correct point in the pattern to lase and fire. The second product, a practice videotape, when used with a mock-up of the Gunner's periscope and control, handles, provides practice in anticipating the reticle movement, as well as in lasing and firing. The third product, a series of tank stabilized gunnery exercises, allows soldiers to practice on M60A3 tanks some of the things presented in the knowledge videotape and practice using the practice tape device. The three products of the training program development appear to be useful at the OSUT level. The knowledge videotape can be group administered using equipment available in any OSUT battalion. The gunner response device is relatively inexpensive to produce and can be set up in a dayroom or corner of a classroom. The M60A3 tank stabilized exercises can be practiced any time a soldier is in the Gunner's seat and the tank is moving, say from the motor pool to the firing range or driving course.

39. Harris, J.H. & Melching, W.H. (HumRRO), Morrison, J.E. & Goldberg, S.L. (ARI). Development and evaluation of a stabilized gunnery training program. HumRRO FR-MTRD-(KY)-82-1. ARI RN-82-17. February 1982. (AD A126 873)

A program to train M60A3 tank gunners in stabilized gunnery was developed, tried out, revised, and tried out again on a sample of soldiers. While experimental groups acquired significantly more knowledge about stabilized gunnery techniques than did control groups, they did not perform significantly better than controls on the criterion test.

40. Melching, W.H., Campbell, R.C. & Hoffman, R.G. Target scenario specifications for use with the Perceptronics MK 60 tank gunnery device. (HumRRO RP-MTRD-(KY)-82-4). July 1982.

A tank gunnery training device employing videodisc technology has been developed by Perceptronics, Inc. To employ the device and to assess its usefulness in institutional training, videodisc training materials must be prepared. To guide the preparation of training materials, a set of target scenario specifications was needed. This report (1) describes the activities that were undertaken to develop the specifications and (2) provides a copy of the specifications that were produced. Appendix A guides the filming of target scenes and the preparation of videodisc scenarios, while Appendix B describes the target scenarios that could be programmed on a videodisc using films currently available at Perceptronics.

41. Melching, W.H. & Healy, R.D. Comparative training capabilities and test concepts for selected tank gunnery training devices. HumRRO RP-MTRD-(KY)-82-3. ARI RP 83-9. December 1982. (AD A140 165)

This research product was developed to assist in providing evaluation information about the following tank gunnery devices: Eye-Safe Simulated Laser Rangefinder (ESSLR), Conditionally Eye-Safe Simulated Laser Rangefinder (CESSLR), Multiple Integrated Laser Engagement System (MILES), TELFARE Tank Gunnery Sub-Caliber Trainer, and SAAB BT-41 Tank Combat Simulator. Comparative analyses were made of the devices (viz., ESSLR, CESSLR vs. Dry Fire;

MILES, TELFARE, BT-41 vs. Dry Fire) to identify explicit capabilities, and to elicit factors that might suggest additional analyses or evaluation. Recommended test concepts and experimental designs are provided.

42. Morrison, J. Procedure Guides - M60A3 Tank. Submitted to ARI as RP. July 1982.

One volume: Tank Commander, Gunner, includes directions for operating the Tank Thermal Sight and the M1050 telescope, the computer system with a computer self-test and operational response test that includes a wind stress test. Directions for boresighting with and without a muzzle boresight device and zeroings, testing, boresighting zeroing on 7.62 mm machinegun, PMCS.

43. Morrison, J.E. Retention of armor procedures: A structural analysis. ARI TR-591. October 1982. (AD A140 003)

To determine the structure of memory for armor procedural tasks, proximity analyses (Friendly, 1979) were performed on verbal recall and hands-on performance of selected procedures. Structural analyses confirmed that armor crewmen organize their memory for procedures according to the hierarchical goal structures of the tasks. Comparisons of entry-level and field unit armor personnel showed significant decrements in skill performance over time, however, there were no systematic differences in memory structure between the two groups. Structures derived from verbal recall were highly indicative of hands-on structures for crewmen still in training, but the relationship between verbal and hands-on structure was not as strong for armor crewmen in field units. Problems and implications of the structural analyses were discussed.

44. Morrison, J.E. & Goldberg, S.L. A cognitive analysis of armor procedural task training. ARI TR-605. March 1982. (AD A139 795)

Traditional and performance-oriented approaches to procedural training were compared, and their deficiencies were noted. A cognitive interpretation of procedural learning was advanced and training implications were discussed. Representative armor procedures were analyzed to derive the underlying memory structures required for recall. Specific training applications of the memory structures were also discussed.

45. O'Brien, R.E., Drucker, E.H. & Bauer, R.W. Guidelines for preparing armor platoon drills and tactical leadership exercises. Volume 2: Tank platoon battle exercise "Conduct tactical movement." ARI RP-83-08. HumRRO FR-TRD-(KY)-82-10. December 1982. (AD A139 878)

Research was conducted to supplement drill development guidelines so that they would be suitable for use by armor units, to incorporate tactical platoon leader training into these guidelines, and to implement the revised

methodology for drill development by preparing a set of drills for tank platoons and leadership exercises for tank platoon leaders. This volume contains prototype drills and platoon leader exercises that were prepared using the revised guidelines.

46. Silbernagel, B.L., Vaughn, J.J., Jr. & Schaefer, R.H. Development of M1 (Abrams) tank sustainment training material. ARI RR-1334. June 1982. (AD A134 511)

The purpose of this research was to: design and develop M1 crew procedure guides for tasks performed before, during, and after tank operations; and design, develop and evaluate low-cost sustainment training material for skill enhancement on various tank combat tasks. This report discusses the history of the research effort and the results of the field evaluations. Research findings indicate the media types utilized are viable and effective for sustainment training purposes.

47. Witmer, B.G. & Burnside, B.L. Feedback needs of training developers and evaluators. ARI RR-1351. August 1982. (AD A138 325)

This report examines the needs of training developers for feedback from the field on the quality of their products and ways that these needs can best be served. Feedback provided to training developers by training evaluators at one large Center/School is discussed, and strategies for increasing the quantity and quality of this feedback are provided. Suggestions for designing an integrated data management and feedback system are also provided. Findings should be of interest to training developers and evaluators.

48. Witmer, B.G. & Kristiansen, D.M. The development and field trial of a system for evaluating the effectiveness and efficiency of a training program. ARI RR-1336. March 1982. (AD A133 160)

A unique system designed to assist training managers or evaluators in increasing the effectiveness of training programs has been developed, tested, and refined. The Training Program Evaluation (TPE) system offers advantages over traditional approaches of assessing program effectiveness. TPE involves the direct observation of training and testing and does not rely on second-hand accounts of training given by trainers or trainees. Neither does TPE require the construction and administration of specially designed tests to evaluate soldier performance, but utilizes instead the tests routinely given after each block of instruction. During its development, TPE has undergone frequent field testing to determine its utility to the Army. The major test of TPE came during the M1 tank OT-III, where TPE was used to evaluate the effectiveness of the M1 transition training program and to suggest program improvements. The utility of TPE was clearly demonstrated during the M1 OT-III where several agencies used TPE to gather training effectiveness information that was used to improve the training program. This report describes the development of TPE and its field trial during the M1 tank OT-III.

49. Blasche, T.R. & Lickteig, C.W. Utilization of a vehicle integrated intelligence [V(INT)^2] system in armor units. FKFU WP 83-3. October 1983. Submitted as ARI RP.

The complexity, sophistication, and lethality of the future battlefield as envisioned in the scenarios of AirLand Battle 1000 requires the development of vehicle integrated intelligence [V(INT)^2] systems for armor units. A critical component in the design and development of the V(INT)^2 system is the determination of the volume, format, and level of battlefield information needed by commanders at different levels of combat support. This report analyzes and describes the functional and informational requirements unique to each of the following echelons: battalion, company, platoon, and individual armored vehicles. In support of these requirements the capabilities of V(INT)^2 for the acquisition, transmission, and interpretation of this battlefield information are identified and illustrated. The doctrinal implications of V(INT)^2 for combat vehicles are suggested, and they substantiate the system's potential for a revolutionary impact upon armor operations. In conclusion the report provides a foundation for determination of the user-oriented guidelines and hardware specifications required for the design and development of the V(INT)^2 system architecture.

50. Burnside, B.L., Witmer, B.G. & Kristiansen, D.M. Training feedback handbook. ARI RP 83-7. January 1983. (AD A132 565)

This handbook is designed to assist training developers and evaluators in structuring their collection of feedback. Six methods of collecting feedback are described, and practical guidelines for their application are offered. Issues in the management and analysis of feedback are also discussed.

51. Kottas. B.L. & Bessemer, D.W. Command vehicle choice during field training exercises: Problems and proposed solutions. ARI RR-1348. January 1983. (AD A139 790)

Research investigated the extent to which Armor company commanders' use of their tanks as command vehicles during field training exercises is inconsistent with the doctrinal statement of the US Army Armor School. Questionnaire responses of Armor and Armored Cavalry officers identified several factors contributing to command vehicle choice and indicated reactions to proposed product improvements to aid command, control, and communication (C3) functions in a tank Armor officers reported little use of the M60 tank as a command vehicle during field training exercises. Responses revealed apparent misunderstanding of doctrine related to command vehicle choice, and demonstrated that Armor officers acknowledge the necessity of training C3 functions in tanks. Officers surveyed responded favorably to suggested product improvements intended to facilitate C3 functions in the areas of communications, navigation, and workspace human factors.

52. Kottas, B.L. & Bessemer, D.W. Use of optical and thermal sights in daylight target detection. ARI RR-1358. February 1983. (AD A140 335)

The Fort Knox Field Unit of ARI investigated the use of optical and thermal sights for daylight target detection. Armor soldiers were asked to detect targets in optical sight displays, thermal sight displays, and displays in which optical and thermal scenes alternated. Alternating between thermal and optical sights produced more target detections than using either sight alone over all terrain conditions, but did so at the expense of time. In dense vegetation, alternating between optical and thermal sights produced the highest target detection performance. In contrast, when searching for targets in mixed terrain, optical sights alone produced the best target detection performance with respect to both speed and accuracy. Performance with the thermal sight improved over trials, demonstrating the need for target detection training with the thermal sight and the increase in performance that can occur when systematic feedback is provided to those undergoing training.

53. Kraemer, R.E. Fire commands for the M60A3 tank. January 1983. Booklet 1: Overview of fire commands for the M60A3 tank, ARI RP 83-1A; Booklet 2: Classifying threats, RP 83-1B; Booklet 3: Ammunition/weapon selection, RP 83-1C; Booklet 4: Fire command elements and sequence, RP 83-1D; Booklet 5: Single target engagements, RP 83-1E; Booklet 6: Multiple/simultaneous target engagements, RP 83-1F.

These booklets are used for sustaining skills or cross training. Short presentations of graphic and written description of scenarios are followed by self-tests and correct answers with reasons given for wrong choices.

54. Kraemer, R.E. Degraded mode gunnery for the M60A3 tank. Booklet 1: Overview. ARI RP 83-2-A. January 1983. Booklet 2: Non-immediate engagement. RP 83-2-B. Booklet 3: Immediate engagements. RP 83-2-C.

(Booklet 1) Training for crew who already know how to set up gunner's station and deal with normal mode gunnery. This training will enable a crewmember to take correct action if a gunnery system fails during a non-immediate or immediate engagement. Deals with failure of Laser Rangefinder Laser interface, computer unit, automatic lead, cant sensor, crosswind sensor, output unit, stabilization system, tank thermal sight, turret power control system, gunner's control unit, and gunner power control handle trigger. (Booklet 2) Scenarios that include a picture and written description of a battlefield situation with the status of the tank and questions to be answered. Answers are provided. Used for training or cross training in gunnery system failures and with enemies who have not yet seen you. (Booklet 3) Scenarios, descriptions and questions for training and cross training a crew in case of gunnery system failure, and an enemy who has sighted them.

55. Kraemer, R.E. Multiple return strategies for the M60A3 tank: User's guide. ARI RP-83-3. January 1983.

Practice booklet to use with laser rangefinder. Deals with LRF safety requirements, receiver-transmitter controls and indicators and operational procedures. Section IV contains a number of multiple return scenarios with a graphic representative and written description of a battlefield situation, the status of the LRF and a question to be answered. Correct answers are provided.

56. Kraemer, R.E. The development of crew drills for armor weapon systems. ARI RP 83-5. January 1983. (AD A140 597)

This report describes the methodology used to design and develop crew drills for armor weapon systems. In the design of the crew drills training approach emphasis was placed on incorporating the concept of dry-fire training in a low cost environment. Also included were concepts for program management, task performance and evaluation, and quality control. Applying these concepts, a set of tank gunnery crew drills was developed for the M1 General Abrams, M60A3, and M60A1 (AOS) tanks. Specific task requirements were detailed for each weapon system by crew position and phases of target engagement. Task behaviors considered critical to crew performance were identified for evaluation.

57. O'Brien, R.E. & Drucker, E.H. Training objectives for tank platoon leaders covering tasks performed during four armor operations. ARI RP-83-12. HumRRO RP-TRD-(KY)-83-1. January 1983. (AD A136 276)

This report contains a format for preparing training objectives for tactical leadership tasks. It also contains prototype training objectives for tactical leadership tasks performed by platoon leaders of tank platoons during portions of Movement to Contact, Hasty Attack, Occupy Battle Position, and Defend Battle Position.

58. Sticha, P.J. & Knerr, C.M. Task-element and individual differences in procedural learning and retention: A model-based analysis. Decisions and Designs, Inc. Final Report DDI/PR 83-1-334. February 1983. Submitted as RN.

The rate at which performance improves during training, and the extent to which information is retained during intervals without practice, is a concern of those who plan and manage military training. This report was prepared for the US Army Research Institute, Fort Knox, Kentucky, and illustrates the application of mathematical models to investigate issues regarding acquisition and retention of complex military skills. The purpose of this report is to test a model of learning and retention of Armor procedures. Specifically, the ability of the model to account for task-element and individual differences identified in earlier research was examined. The findings of this report provide some empirical support for a model of procedural skill learning and retention which could be used to assist the training manager in determining training requirements for various tasks. However, the analysis of learning and retention issues is largely exploratory, and future research is necessary to confirm the findings of this study. This report concludes with a discussion of possible directions future research could take.

59. Taylor, E.N. A review of literature relevant to unaided tactical decision making. ARI RN 83-35. September 1983. (AD A136 549)

As part of a larger research effort entitled "Mission-Based Simulation and Training Requirements," a limited search was conducted for literature relevant to unaided tactical decision making. The specific purpose was to acquire information that could be used to develop a methodology for training military leaders to make tactical decisions. Particular emphasis was placed upon the training of US Army Armor tank platoon leaders as tactical decision makers. Two approaches to the study of decision making were discussed: (1) the prescriptive (economic or rational) model which holds that opinions should be expressed in terms of subjective probabilities and revised by application of Bayes' Theorem as new information is received; and (2) the descriptive approach which attempts to delineate the decision maker's behavior as accurately as possible. On the whole, the literature review demonstrated that people do not use a prescriptive model, especially in complex or multiattribute situations. Several studies of tactical decision training for small military units were reviewed, as were a number of commercial programs available for decision making training. Procedures used by the Air Force and NASA to train air/space craft personnel to respond to various emergency situations were described. Two problems encountered by developers of decision making training programs were discussed: (1) providing for consequences of decisions and (2) evaluating decision making performance. It was concluded that training a decision maker to apply the prescriptive model without the assistance of aids (such as a computer) is not likely to prove effective. Three approaches to training in decision making were recommended.

1984

60. Burroughs, S.L. Criterion performance measures for M1 tank driver tests. Submitted as ARI RR. June 1984.

Scoring techniques for eight driver tests were revised in accordance with suggestions made in the original M1 tank test report. The tests were administered to 40 experienced M1 tank drivers. Performance scores of experienced M1 tank drivers were then compared to M1 OSUT trainee drivers' performance scores to determine performance changes which occur with driving practice. The identified performance changes helped set the parameters constituting the acceptable ranges of scores for drivers to achieve after the basic driving course. The criterion measures will also be useful in determining standards against which driver simulator performance can be compared.

61. Campbell, R.C., Campbell, C.H., Knerr, C.M. & Burroughs, S.L. M1 tank drivers tests. HumRRO FR-TRD-(KY)-82-8. Submitted to ARI as RR. May 1984.

The purpose of this research was to develop reliable tests of nonprocedural M1 tank driver skills that could serve as quantitative measures for tank driver simulator performance. Eleven driving tasks were derived from an Army Research Institute criticality survey. Analysis of the tasks

resulted in decisions to test nine of the tasks, but only those aspects that related to the driver and were feasible for testing. The tests were tried out on 77 soldiers in two M1 OSUT classes. The data were used to assess scorer agreement and internal consistency, to estimate validity and utility based on reliability and variability and to direct revisions and recommendations for future testing. For each of the nine tests, the data indicated that driver performance could be measured reliably. Tests were designed so that usable quantitative data could be obtained. Although refinements and broader applications of the tests are required, the tests should serve the purpose for which they were designed.

62. Drucker, E.H., Hannaman, D.L., Melching, W.H. & O'Brien, R.E. Analysis of training requirements for the basic noncommissioned officer course for M1 tank commanders (19K BNCOC). MDA 903-83-C-0346. Submitted for publication as ARI RR, June 84.

An analysis was conducted of the 19K duty position (M1 tank crewmen) to identify additional tasks which should be trained in the Basic Noncommissioned Course for M1 tank commanders (19K BNCOC). The Systems Approach to Training was used to supplement the inventory of critical tasks that had been developed earlier by the Directorate of Training and Doctrine. A total of 16 critical tasks not currently trained in 19K BNCOC were recommended for inclusion in the course. In addition, the recommendation was made to modify three tasks and delete three others. Decision making, problem solving, and interactive tasks performed by tank commanders were also identified. The training devices, aids, and materials that will be available for use in 19K BNCOC for training tank commanders within the next three years were identified along with those that will be available in units for use by tank commanders to train their crews. The impact of new training systems and technologies on 19K training developers, instructors, and students was discussed along with the need for instructional computer literacy.

63. Graham, S.E. & Black, B.A. An evaluation of physical readiness training in Armor One Station Unit Training. FKFU WP 84-1. August 1984. Submitted as ARI RR, July 1984.

Evaluates the effectiveness of a newly developed Physical Fitness Training Program in Armor One Station Unit Training (OSUT) and identifies variables which predict Army Physical Readiness Test (APRT) performance.

64. Henricksen, K., Jones, D.R., Sergent, L.C. & Rutherford, B.E. Assessment of tactical training methodologies. Submitted as ARI RR, June 1984.

The purpose of the research is to assess current and projected tactical training methodologies at the platoon/company leader level to identify major gaps in the state-of-the-art. Doctrinal/tactical leadership task information and media/training device information was collected from interviews with Army representatives and instructors; reviews of the literature, Army manuals and publications, and task listings; a questionnaire survey of Armor Officer Advanced Course students; and observation of tactical exercises at

Fort Knox. First, it was found that platoon leader tasks associated with Movement to Contact, Hasty Attack, Counterattack and Passage of Lines missions were the most difficult for acquiring proficiency and for which further training is needed. Second, detrimental training environment influences such as cumbersome logistical support requirements and lack of a perceived training need threaten an effective utilization of REALTRAIN and MILES as tactical training methodologies. Third, there is an absence of state-of-the-art, low-cost tactical training devices and simulations at the small unit level for exposing leaders to tactical problems. Fourth, advances in microcomputer technology combined with new initiatives to tactical training have the potential to provide a truly integrated tactical training strategy.

65. Henricksen, K., Jones, D.K., Sergent, L.C. & Rutherford, B.E. Media device configurations for platoon leader tactical training. Submitted as ARI TR, June 1984.

The purpose of the research effort was to define and conceptualize media/device combinations which have potential to support effective training on tactical leadership tasks for armor platoon leaders. Critical tasks were selected from platoon operations for development of offensive and defensive scenarios. Each scenario was examined for platoon leader actions and associated events for the specification of functional capability requirements. Concurrently, information was gathered on a wide range of technological options. The technological options were organized into generic subsystem conceptualizations from which compatible media/device configurations were identified. The configurations were rank ordered with respect to functional capability and other evaluation criteria, serving to identify those with the greatest potential for supporting training on specific tactical tasks. The highest rankings went to the multiple processor devices that offer a dedicated graphics capability. Such devices provide sufficient display power to represent appropriate battlefield conditions, allow for adequate computing power thus minimizing software development costs, and derive added design and development flexibility through the availability of mature, supporting software packages.

66. Hoffman, R.G. Memory organization-based methods of instruction: Rationale and development. ARI RN-84-25. January 1984. (AD A137 504)

An effort was made to improve training techniques in order to increase retention of procedural tasks common to armor crewmen. Based on an overview of principles of cognitive, information processing psychology concerning the structuring of information in memory and on research using various memory organization mnemonics, a general training strategy was described. The strategy began with a systematic structure analysis of tasks to be trained. Training was then designed to give students the organizing structure to aid their recall of the task. Two alternative strategies for presenting the structure were developed: one in which the structure guided the presentation from the beginning of training, and one in which students were first allowed to have hands-on exposure to the task before being given the

structure information. Training programs using these two training strategies, along with programs using the Army's standard performance-oriented training strategy were developed for four tasks performed by M1 (Abrams) tank crewmembers.

67. Hoffman, R.G., Drucker, E.H., Morrison, J.E. & Goldberg, S.L. Memory organization-based methods of instruction: A comparison with performance-oriented training. ARI RN-84-26. October 1983. (AD A137 640)

Based on an overview of principles of cognitive, information processing psychology concerning the structuring of information in memory, training was designed to give students task organizing information to aid their recall of four armor crewman tasks. Two alternative strategies for presenting the structure were developed: one in which the task structure information guided the presentation from the beginning of training, and one in which students were first allowed to have hands-on exposure to the task before being given the structure information. Under the constraint that these alternative training programs should not cost extra training time, they did not improve learning over the Army's standard performance oriented training strategy. Discussion concerned the role of practice and student ability in the acquisition of memory organization during learning.

68. Hoffman, R.G. & Melching, W.H. Field trials of the MK60 tank gunnery simulator in armor institutional training courses. Volume I: Final Report. HumRRO FR-TRD-(KY)-82-9. November 1982. Submitted to ARI as RR, 1984.

Training simulators, developed to ease the burden on resources and to provide low-cost alternatives, must be field tested prior to their use. This report describes the field trials of the Perceptronics MK60, a part-task tank gunnery simulator which through computer control (1) presents target engagements recorded on a videodisc, (2) enables students to operate switches and controls, track and fire, and (3) provides feedback about their performance. The purpose of the field trials was to assess, in an institutional setting (1) the training effectiveness of the MK60 for teaching gunnery skills, (2) the transfer of that training to M60A1 tank performance, (3) the validity of the MK60 for predicting M60A1 performance of individual soldiers, and (4) the opinions of students and instructors. Field trials were conducted with Armor Officer Basic students and with enlisted students in Basic Armor Training. Two intensities of simulator training were compared to the normal programs of instruction. Results indicated that (1) performance on the simulator increased as a direct function of practice time, with improvements in speed of achieving target hits and in consistency of gunner verbal responses; (2) transfer of training from the MK60 to dry fire and live fire on the M60A1 tank appeared equal to that of the devices currently used in gunnery training; (3) the MK60 was not predictive of individual soldiers' M60A1 performance; and (4) students and instructors found the simulator challenging, realistic, and they were very favorable toward its use.

69. Hoffman, R.G. & Melching, W.H. Field trials of MK60 tank gunnery simulator in armor institutional training courses. Volume 2. Training and testing materials. ARI RN-84-60. HumRRO FR-TRD-(KY)-82-9; February 1984. (AD A138 572)

Field trials in institutional courses of a recently developed tank gunnery simulation device (MK60) were conducted. The field trials required the preparation of specific training and testing materials. Copies of all materials prepared for use in the field trials are provided.

70. Kraemer, R.E. Fire commands for the M1 Abrams tank. ARI RP 84-11. Booklet 1: Overview of fire commands, 84-11A; Booklet 2: Classifying threats, 84-11B; Booklet 3: Ammunition/weapon selection, 84-11C; Booklet 4: Fire command elements and sequence, 84-11D; Booklet 5: Single target engagements, 84-11E; Booklet 6: Multiple/simultaneous target engagement, 84-11F. June 1984.

Arranged from simple to complex meant to sustain skills and cross-train. Not designed as initial training. Crewmen should have knowledge of Soviet Bloc weapon system's capability, knowledge of M1 system and nomenclature and familiarity with FM-17-12-1 Tank Gunnery. Booklets can be used for individual study as a performance test or as competition. Booklet 1: Each concept explained with self-test questions and answers. Booklets 2-6: Use graphic representations and written descriptions of battlefield scenarios followed by a multiple choice question and on the next page--correct answer and explanations of why other choices were wrong.

71. Kraemer, R.E. Degraded mode gunnery for the M1 tank, ARI RP 84-12. Booklet 1: M1 gunnery systems, 84-12A; Booklet 2: Non-immediate engagements, 84-12B; Booklet 3: Immediate engagements, 84-12C. June 1984.

Designed to sustain skill of gunners and cross-train other personnel to gunner positions. It is assumed that crewmen know how to set up gunner's station on the M1 tank and deal with normal mode gunnery. Booklet 1: Description of gunnery systems, review questions and answer key; Booklets 2 and 3: Graphic and written description of battlefield situation. Question (multiple choice)-answer key with feedback as why other alternatives are wrong. Booklet 2 has 38 scenarios; booklet 3 has 25 scenarios.

72. Kraemer, R.E. M1 tank gunnery multiple returns. ARI RP 84-13. June 1984.

Deals with multiple range returns that may occur when ranging to a target using the laser rangefinder (LRF). Topics addressed include range returns and GPS(E) symbology, LRF settings, and dealing with multiple returns. Review questions follow each presentation with answer key provided. Section 2 has 10 battlefield scenarios depicted graphically and in words, followed by a multiple choice question with the correct answer and incorrect choices on the next page.

73. Kraemer, R.E. Development and validation of sustainment training materials for M60A3 armor crewmen. Submitted as ARI RR, July 1984.

This report describes research efforts to develop and evaluate training materials that M60A3 armor crew members can use to supplement, enrich, and thereby sustain proficiency in three critical job performance areas: fire commands, degraded mode gunnery, and multiple returns. Highly structured knowledge booklets were written to present the subject matter in each performance area with separate and integrated battlefield scenario booklets attached to provide realistic practice opportunities for knowledge application, retention, and skills transfer to novel situations. Front end analysis clearly indicate that the training materials are viable for individual skills sustainment and cross training purposes. The actual training effectiveness of the materials for use by armor crewmen remains undetermined.

74. Kraemer, R.E. A rapid train-up program for M60A3 armor force mobilization or reconstitution. Submitted as ARI RP, September 1984.

Training modules were developed for use by trainers to prepare for conducting M60A3 individual skills training and to use as a training prescription--telling how to train and what to cover--during training delivery. Included is a trainer's guide developed to explain the trainer's role, the contents and use of the training modules, and to give general "How to Train" guidance. Also included is a training manager's guide for training managers (i.e., platoon leaders) to explain their role in training, describe the training modules, and provide guidance for training management and evaluation.

75. Simpson, H., McCallum, M.C., McIntyre, S., Casey, S.M. & Fuller, R.G. Armor training in combat units. Volume 1: Development of methodologies for task selection, prioritization, and training definition; Volume 2: Training products. ANACAPA Sciences, contract MDA 903-82-C-0380, 15 March 1984. Submitted as ARI RR.

Methods were developed to select and prioritize armor crew tasks, and to define the scope, content, and methods to employ in armor crew individual training. These methods were applied to the duties and tasks of M60A3 tank commanders and gunners. Methods, results, and products of this project were the task selection methodology, lists of M60A3 tank commander and gunner tasks selected, task prioritization methodology, prioritized lists of tank commander and gunner tasks, training definition methodology, 46 training modules, and Trainer's and Training Manager's Guides. The task selection methodology is a 13-step top-down, mission-oriented approach that permits the training developer to select tasks systematically for coverage in unit-level individual training. Its effectiveness is limited by the quality of the source documents used and the expertise of the training developer. Two task prioritization methodologies were developed. Method One is the most objective and reliable, but also the most time- and labor-intensive. It relies primarily on questionnaire data and enables objective, rule-based prioritization. Method Two relies primarily on subject-matter-expert (SME) judgments and is less time- and labor-intensive than the first method, but is

also less objective and reliable. The training definition methodology reflects the instructional system development (ISD) model, performance-oriented training, and the findings of research in training and cognition. It permits the training developer to define the scope, content, and training methods for unit-level individual training on the selected tasks.

76. Sticha, P.J., Edwards, T.D. & Patterson, J.F. An analytical model of learning and performance of armor procedures. ARI RN-84-24. January 1984. (AD A138 000)

The rate at which performance improves during training and the extent to which information is retained during intervals without practice is a concern of those who plan and manage military training. This report documents the development and features of a model to investigate issues regarding acquisition and retention of complex, military skills. The modeling effort focused on procedural armor tasks. Learning and retention models were developed for eight tasks performed by the driver, gunner, and loader positions in the M60A1 tank. Sequencing control was modeled using the SAINT (System Analysis of Integrated Networks of Tasks) simulation system. Psychological models described acquisition, retention, retrieval and choice of task information. Models were validated by comparing their predictions to two samples of data, one composed of soldiers in training, and one from soldiers in operational armor units.

77. Vaughan, J.J. Silbernagel, B.R. & Goldberg, S.L. M1 Abrams Tank Procedures Guide - Tank Commander. Army Research Institute-Fort Knox, July 1981. Also volumes for gunner, loader, and driver, RP 82-09. June 1984.

A checklist in a small plastic bound book, designed to be used in the tank. Includes task checklists for preparing station, prefire checks, securing station, additional activities, and preventive maintenance check.

78. Witmer, B.G. Field-expedient maintenance experiences of M60-series tank crewmen. ARI RR 1345. June 1984. (AD A143 243)

During combat, tank crewmen may need to employ field-expedient maintenance techniques to repair a malfunctioning tank. Reports of field-expedient maintenance being performed are numerous, but no data have been available on the types of techniques used nor the effectiveness of these techniques. This study collected 76 incidents of field-expedient maintenance from 33 NCOs using the critical incident technique. Fifty of the incidents were used to derive eight categories of field-expedient maintenance. The categories suggest generalizable strategies for making field-expedient repairs. In addition, the specific incidents of field-expedient maintenance on M60-series tanks identified during the study provides information that may be used in designing a program to train tank crewmen to make specific field-expedient repairs.

79. Zagorski, H.J. & Travis, K.M. Training objectives for tank platoon leaders' interview excerpts and analysis. ARI RN 84-62. February 1984. (AD A138 728)

Focus group research was conducted to evaluate a new format for preparing Army training objectives for tactical leadership tasks. A second objective was concerned with the approach to be taken in extending this format to include training standards for use in after-action reviews. Twelve groups of Army personnel knowledgeable in tactical leadership were interviewed. The new format was perceived as potentially useful in tactical leadership training. Alternatives regarding the extension of the format to include training standards were provided by the participants.

80. Zagorski, H.J. & Travis, K.M. Training objectives for tank platoon leaders: A focus group evaluation. ARI RR 1365. June 1984.

Focus group research was conducted to evaluate a new format for preparing Army training objectives for tactical leadership tasks. A second objective was concerned with the approach to be taken in extending this format to include training standards for use in after-action reviews. Twelve groups of Army personnel knowledgeable in tactical leadership were interviewed. The new format was perceived as potentially useful in tactical leadership training. Alternatives regarding the extension of the format to include training standards were provided by the participants.

Author Index

Bauer, R.W. 15, 16, 36, 45
Bessemer, D.W. 1, 2, 5, 6, 7, 14, 27, 28, 51, 52
Biers, D.W. 32
Black, B.A. 17, 34, 63
Blasche, T. 49
Burnside, B.L. 18, 33, 47, 50
Burroughs, S.L. 60, 61
Campbell, C.H. 2, 6, 19, 34, 35, 37, 61
Campbell, R.C. 3, 4, 35, 40, 61
Casey, S.M. 75
Dressel, J.D. 21
Drillings, M. 21
Drucker, E.H. 20, 29, 31, 36, 45, 57, 62, 67
Farrel, J.R. 8, 9, 10, 11, 12, 13
Fuller, R.G. 75
Goldberg, S.L. 21, 37, 38, 39, 44, 67, 77
Graham, S.E. 63
Hahn, W.D. 16
Hannaman, D.L. 62
Harris, J.H. 2, 5, 6, 14, 19, 38, 39
Healy, R.D. 41
Henricksen, K. 64, 65
Hoffman, R.G. 40, 66, 67, 68
Jones, D.R. 64, 65
Kane, J.J. 22
Keller, S.D. 23
Knerr, C.M. 23, 61
Kottas, B.L. 1, 7, 51, 52
Kraemer, R.E. 6, 17, 53, 54, 55, 56, 70, 71, 72, 73, 74
Kristiansen, D.M. 24, 25, 26, 48, 50
Laurance, J.H. 23
Lickteig, C. 49
McAleese, K.J. 5
McCallum, M.C. 75
McIntyre, S. 75
Melching, W.H. 27, 39, 40, 41, 62, 69
Morrison, J.E. 28, 38, 39, 42, 43, 44, 67
O'Brien, R.E. 20, 29, 31, 36, 45, 57, 62
Osborn, W.C. 27
Sauer, D.W. 32
Rutherford, B.E. 64, 65
Schaefer, R.H. 46
Schulz, R.E. 8, 9, 10, 11, 12, 13
Sergent, L.C. 64, 65
Silbernagel, B.L. 46, 77
Simpson, H. 75
Smith, D.A. 14
Sticha, P.J. 58, 76
Taylor, E.N. 35, 59
Travis, K.M. 79
Vaughn, J.J., Jr. 46, 77
Witmer, B.G. 25, 26, 30, 47, 48, 50, 78
Yore, B.J. 31
Zagorski, H.J. 79, 80